Idiographic Emotion Structures in Subjective Emotional Experiences

by

Alexander F. Danvers

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Graduate Supervisory Committee:

Michelle N. Shiota, Chair
Steven L. Neuberg
Polemnia G. Amazeen
Douglas T. Kenrick

ARIZONA STATE UNIVERSITY

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ABSTRACT

Psychological theories often reduce descriptions of people's emotional experiences to a small number of underlying dimensions that capture most of the variation in their responses. These underlying dimensions are typically uncovered by comparing the self-reported emotions of many individuals at one specific time point, to infer a single underlying structure of emotion for all people. However, theoretical work suggests that underlying dimensions uncovered in this way may not hold when modeling how people change over time. Individuals may differ not just in their typical score on a given dimension of emotion, but in what dimensions best characterize their patterns of emotional experience over time. In this study, participants described two emotional events per day for 35 days, and analyses compared individualized structures of emotion to those generated from many people at one point in time. Analyses using R-technique factor analysis, which compares many people at one time point, most often uncovered a two-factor solution corresponding to positivity and negativity dimensions - a solution well-established in the literature. However, analyses using P-technique factor analysis, which compares many emotional events for one person, uncovered a broader diversity of underlying dimensions. Individuals needed anywhere from one to five factors to best capture their self-reported emotions. Further, dimensions specifically related to romantic relationships were much more common when examining the experiences of individuals over time. This suggests that external factors, such as pursuing or being in a romantic relationship, might lead to a qualitative shift in how emotions are experienced. Research attempting to characterize emotion dynamics, including those attempting to help people shift or regulate their emotions, cannot assume that typical two dimensional structures of

emotional experience apply to all people. Instead we must account for how individuals

describe their own emotional experiences.

DEDICATION

To Camille, Gwendy, Bill, and Henry

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INTRODUCTION

Emotions have important psychological and behavioral consequences, influencing the way we socialize, what we remember, how we evaluate information, and what goals we pursue (Fischer & Manstead, 2016; Izard, 2007; Lazarus, 1991; Levenson, 2003; Shiota et al., 2014). Psychologists have long used people's reports on their own emotional experiences to try to gain insight into deeper structures underlying emotion. For example, the conceptual act theory describes two biologically basic dimensions of emotion (Barrett, 2006a). These were originally derived from an analysis of people's self-reported emotions (Russell, 1980). Even among theorists who do not claim to identify biologically basic or universal dimensions of emotion, many acknowledge the importance of people's appraisals—or subjective interpretations of situations—for behavioral and physiological outcomes (Lazarus, 1991; Roseman, 1984).

Most studies examining individuals' ratings of their emotional experiences are based on comparisons of many people at one specific time point. However, theoretical and empirical work has found that psychological constructs established by examining a cross section of people at one point in time do not necessarily apply to people changing over time (Molenaar, 2004; Molenaar & Campbell, 2009). This means that, although a set of core dimensions emerges repeatedly when analyzing data from a survey taken at one time point, these core dimensions might not apply to any of the specific people surveyed across time points. To establish how people's emotions change, each individual's specific pattern of responses needs to be analyzed separately. The underlying dimensions that correspond to how people change can only be established at the individual level.

In this study, I examined different individuals' underlying emotional dynamics. I characterized each individual's emotional life by examining which states she or he tended to experience together. The way that emotions tend to be experienced together in one individual, as compared to others, makes up the idiographic structure of emotion for that person. For example, one individual might tend to experience pride, anger, and excitement together in one common group (a "controlling" set of emotions), while sadness, fear, and embarrassment are felt in another common group (a "powerless" set of emotions). Another individual, meanwhile, might feel pride, enthusiasm, and amusement together (a "positive" set of emotions), while anger, fear, and embarrassment make up another group (a "negative" set of emotions). The emotional structures of these individuals' experiences fall along different dimensions, and these suggest different underlying ways of responding to the world.

I compared the results of these person-specific analyses to more typical analyses that assume all individuals have the same underlying emotional structure. By comparing these two types of analyses, we can determine what nuances are missed when we assume that all individuals think about and describe their emotional experiences in the same way.

THE STRUCTURE OF EMOTIONAL EXPERIENCE

Is there a common underlying structure that captures the way we subjectively experience emotion? Emotion researchers have debated this question for generations (Barrett, Mesquita, Ochsner, & Gross, 2007; Cacioppo et al., 2000; Ekman, 1992; Izard, 1977; Watson & Tellegen, 1985). Typical studies ask participants to rate on a Likert scale how strongly they feel (or felt) a series of emotions—using terms like angry, afraid, or

excited—during an emotional episode (Russell, 1980; Scherer, 2005; Watson & Tellegen, 1985). These ratings are analyzed using a statistical dimension reduction technique, such as multi-dimensional scaling (e.g., Russell, 1980) or exploratory factor analysis (e.g., Watson, Clark, & Tellegen, 1988).

Results from these studies typically find two, three, or four underlying dimensions are needed to capture the patterns of variability in self-reports, depending on the terms and sample used (Bradley & Lang, 1994; Fontaine, Scherer, Roesch, & Ellsworth, 2007; Scherer, 2005; Watson, Clark, & Tellegen, 1988). The most commonly reported structure involves two factors. One two-factor structure includes valence (positive to negative experiences) and arousal (activated/energized to calm/low energy; Russell, 1980). Another includes positivity and negativity as separate dimensions (so that an individual can be high in both positivity and negativity at once, for example; Watson & Tellegen, 1985). Two versions of the arousal dimension have also been proposed for describing emotional experience: tension (from tense to calm) and energetic arousal (from energetic to tired; Thayer, 1989). However, subsequent researchers have suggested that all these two-dimensional solutions are variants on the same underlying psychological structure, with each research group having labeled the underlying dimensions differently depending on the rotation method used in their analysis (Yik, Russell, & Feldman-Barrett, 1999).

Beyond these two factor structures, other researchers have reported a three-factor structure: valence, potency/control (in control to apathetic), and arousal (Osgood, May, & Miron, 1975). Another study that included terms related not just to subjective feelings but also to other aspects of emotion (like physiological responses) found four factors: valence, potency, arousal, and unpredictability (Fontaine et al., 2007). Recent work with

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an extensive rating list (76 terms) found five factors relating to what are typically thought of as emotion categories: joy, anger, sadness, fear, and shame/jealousy (Osborne, 2014). In addition to these approaches, higher order structures have been proposed based on appraisal theories. In appraisal theory, emotions arise from a set of underlying evaluative dimensions—such as motivational state, situational state, probability, legitimacy, and agency (Roseman, 1984)—but these are not derived solely from self-reports of emotion.

Studies on the structure of emotional experience fall into the broad category of psychological measurement research: trying to understand the unobserved psychological constructs causing thought and behavior. From examining the underlying patterns of self-report responses, larger psychological theories of emotion have been constructed. Most notably, psychological constructivist theories suggest that valence and arousal are core components of experience and more specific emotion labels are added based on situational features (Barrett, 2006b; Lindquist & Barrett, 2008). This has guided further work in other areas, such as research on facial expressions and neural correlates of emotion (Gendron, Roberson, van der Vyver, Feldman Barrett, 2014; Kober et al., 2008).

Although lay descriptions may not fully address the biological complexity underlying emotion, the way that people report their own experiences is certainly an important part of emotion (Barrett, 2006b; Scherer, 2009). Because asking people how they feel is an obvious first step to studying emotion, self-reports are often employed as a comparison point for identifying the neurological and peripheral physiological bases of emotion. Understanding how people describe their own emotional experiences thus plays a central role in a broader theoretical understanding of emotional processes, including

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how we interpret the emotions of others. New conceptions of the underlying dimensions of emotion therefore have the potential to influence large bodies of related research.

PERSONALIZED EMOTIONAL EXPERIENCES:

IDIOGRAPHIC VERSUS NOMOTHETIC APPROACHES

Traditional approaches to psychological measurement make a central—but often overlooked—assumption about the structure of psychological constructs: all individuals have the same basic dimensions (Cervone, 2004; 2005; Mischel & Shoda, 1995; Molenaar, 2004; Molenaar & Campbell, 2009). In other words, when researchers try to uncover the structure of emotion, they assume there is a *single* structure in emotion responding for all people. Whether the structure includes valence and arousal or valence, control, and arousal, the only difference between individuals is where they fall on these dimensions at any given moment.

The alternative to this *variable-centered* approach—traditionally referred to as the nomothetic approach—is a *person-centered* approach—the idiographic approach. In person-centered approaches, the essential *structural* similarity of all individuals is not assumed. Instead, different individuals can have different underlying psychological structures. More concretely, it might be the case that while I tend to describe my emotional experiences based on valence and arousal, my friend might describe her emotional experiences based on valence, control, and arousal. This means that when I report my responses to emotional events, I make a different set of distinctions than her. I might think of feeling sad and feeling angry as both negative, and so report feeling these emotions together. My friend might feel sadness when she has low control but anger

when she has high control, and so report feeling these emotions at different points, based on whether she feels more or less in control of her life.

To take a person-centered approach, researchers need to shift their frame of reference. Instead of comparing one individual, measured at one time, to all other individuals measured at that same time, the person-centered researcher should compare one individual, measured at one time, to him- or herself at other points in time (Molenaar, 2004). Conceptually, this shift is an expansion of the way researchers consider individual differences. In the variable-focused approach, individuals are characterized by their level on a specific construct—for example an extraversion score, or a positivity score. The person-centered approach suggests that there are differences at the level of process— *what* is being measured differs from person to person (Mischel & Shoda, 1995; Read & Miller, 2002; Read et al., 2010; Molenaar, 2004). For example, an individual might not have extraversion or positivity as relevant dimensions; instead, the individual might have a dimension corresponding to a mix of extraversion and agreeableness or a dimension that corresponds to positive social emotions. This heterogeneity in underlying dimensions can arise through individual differences in the typical responses and appraisals of situations that an individual makes. People can parse the world in different ways.

Personality researchers have been at the forefront of this approach (Cervone, 2004; 2005; Mischel & Shoda, 1995; 1999). One important example from personality psychology helps to illustrate the idiographic approach clearly. The dominant taxonomy in personality is the "Big Five" model (John & Srivastava, 1999; McCrae & Costa, 1999). Five Factor Theory was developed, like theories of the structure of emotional experience, through exploratory dimension reduction techniques on a series of Likert

ratings. Researchers asked participants to rate themselves on long lists of personality characteristics, and found five underlying constructs best account for the variability in responses: openness, conscientiousness, extraversion, agreeableness, and neuroticism. Researchers assumed that these personality dimensions—which were developed using a variable-centered approach—would also generalize to describe the structure of individuals rating themselves day in and day out (Lamiell, 1998; McCrae & John, 1992).

In an oft re-analyzed experiment, Borkenau and Ostendorf (1998) asked participants to make daily ratings on a "Big Five" personality scale for 90 days. When this data set is analyzed using a traditional, variable-centered factor analysis, it yields the "Big Five" factors (Molenaar & Campbell, 2009). That is, if you wanted to characterize the differences between the individuals in the study on any given day, the "Big Five" factors would be the best way to do it. But a factor analysis can also be conducted on all the measurements made for a single individual throughout the study. This type of factor analysis—dubbed P-technique factor analysis—finds the underlying structure in one individual's pattern of responses across many different time points (Cattell, Cattell, & Rhymer, 1947; Molenaar & Nesselroade, 2012). Conducting separate P-technique analyses on each of the participants revealed that none of them had the traditional five-factor structure in self-ratings at the individual level. Instead, many of the participants had dramatically different underlying factor structures—with two to six different factors, depending on the individual.

These different personality structures corroborate a statistical point regarding these two approaches: just because researchers see a particular set of structures when conducting a variable-centered analysis, we cannot assume the same set of structures will

be present in a person-centered analysis (Molenaar, 2004; Molenaar & Campbell, 2009). The two approaches are capturing different information. Traditional factor analysis (referred to as R-technique by Cattell, 1952) captures how individuals differ from each at a given point in time. The P-technique, being person-centered, is capturing how an individual's view of her- or himself changes from day to day. For example, one individual might think of themselves as more or less sociable and productive on different days, whereas another individual might think of themselves as more intellectually curious and agreeable on different days. What is needed to understand the processes generating each person's perception of him- or herself over time is a comparison of that individual against themselves.

There is reason to suspect that there are important individual differences in the underlying dynamics of emotional responding. For example, researchers have found that individuals differ in how closely their self-reported emotion matches their physiological responding—referred to as the *coherence* of their emotional responding—and that more coherent responses are related to feeling greater well-being (Van Doren, Brown, Sze, & Levenson, 2015). This is an individual difference in what aspects of emotion travel together. Inertia, or how slowly an individual moves through emotion space, has also been linked to depression proneness—those who are slower to move through emotion space are more prone to depression (Houben, Van Den Noortgate, Kuppens, 2015). This is an individual difference in how emotions change over time.

One of the best developed areas of idiographic research on emotion is research on emotional granularity—also referred to as emotion differentiation (Barrett, 1995; Lindquist & Barrett, 2008; Smidt & Suvak, 2015). Emotional granularity refers to the

degree to which people can make distinctions between their emotions, based on their conceptual knowledge about emotions. Empirically, emotional granularity is measured by examining a series of ratings of emotion terms in a set of individuals over time—an idiographic approach—and calculating the pairwise correlations or intraclass correlation coefficients (ICC) between a predetermined group of emotion ratings. Larger correlations or ICC are indicative of lower granularity, because the emotion terms being analyzed are used more often in the same situation. Emotional granularity measures are often taken just for a set of positive or negative emotion terms, leading to positive emotion granularity and negative emotion granularity scores (Barrett, Gross, Christensen, & Benvenuto, 2001; Tugade, Fredrickson, & Barrett, 2004). Researchers have shown that these idiographic emotion indices are related to outcomes such as emotion regulation and coping styles, and that less ability to differentiate among emotions is related to clinical disorders such as autism, borderline personality disorder, and depression (Barrett, Gross, Christensen, & Benvenuto, 2001; Tugade, Fredrickson, & Barrett, 2004, Smidt & Suvik, 2015).

The emotional granularity approach is an important precursor to this research, because it compares emotion ratings for a single person at many time points. However, it takes an impoverished approach analytically, compared to a P-technique analysis. Emotional granularity measures only examine two emotions at a time, and then average all the pairwise comparisons, whereas P-technique analysis accounts for the full set of inter-correlations among emotion ratings. Emotional granularity measures cannot find common underlying patterns in a set of correlations, while P-technique analysis explicitly

attempts to find common dimensions that can account for the pattern of relationships between ratings.

In a footnote on a paper about emotional granularity, Barrett addresses the possibility of using P-technique factor analysis for emotion ratings over time (Barrett, 2004). She dismisses this approach by saying that factor analysis involves ambiguities, such as factor identification. However, all theoretical work involves ambiguity, as the task is to determine coherent explanations for the messiness of the observed world. By avoiding ambiguity at the level of analysis, emotional granularity measures *assume the answer* to a significant theoretical question: whether a two dimension structure really does apply to emotion all individuals' ratings of their feelings.

The emotional granularity literature therefore moves in an idiographic direction, but does not fully embrace the implications of this research tradition. As methodological researchers have shown, underlying distinctions made when analyzing data nomothetically typically will not apply when analyzing data idiographically (Molenaar, 2004; Molenaar & Campbell, 2009). The two factor valence and arousal structure that the constructivist theory proposes was developed using nomothetic analyses, and so it may not necessarily apply to any individual person's conception of emotions. The analyses I am conducting here therefore take an important step missing from emotional granularity research. If an idiographic analysis suggests that positivity and negativity are not the core underlying dimensions along which a specific individual rates their emotional experiences, then calculating positive and negative emotional granularity for these individuals would not be appropriate. In fact, P-technique factor analysis might actually suggest different ways of conceptualizing granularity. Emotional complexity might be

thought of as the number of underlying dimensions needed to account for the majority of variation in a pattern of responses. The number of factors uncovered by a P-technique factor analysis are one way of capturing the distinctiveness of emotion conceptualizations that respects the need for idiographic analysis.

Newer approaches in emotion research have also begun to embrace an idiographic perspective. For example, relations between self-reported emotions over time have also been characterized as a network, with emotions as nodes and their co-occurrence corresponding to connections between nodes (Bringmann et al., 2016). The strength of these connections can differ among individuals. For example, individuals high in neuroticism were found to have networks that involved more dense connections between emotion self-reports—particularly connections among negative self-reports. In network theory, these interconnections are thought to reflect the degree to which activation of one node increases the likelihood of the activation of others. This suggests that negativity is particularly "contagious" for some people, being more likely to trigger a change in many other emotions (applying epidemiological models to emotion networks is a new and developing area; see Fisher, Reeves, Lawyer, & Rubel, under review). One way to think about neuroticism, therefore, is as a condition where negative emotions tend to spread quickly, reinforcing each other over time.

Network models, like idiographic models, represent a departure from traditional theorizing. Instead of assuming that participant responses are caused by a small group of underlying constructs, network models simply characterize the relationships between many different responses using connection strength (Borsboom & Cramer, 2013; Bringmann et al., 2016; Schmittman et al., 2013). More recently, researchers have

applied a person-centered analysis strategy to described individual differences in the

structure of emotion networks among people suffering from anxiety and depression

(Fisher, Reeves, Lawyer, & Rubel, under review). These idiographic network models

attempt to determine individual differences in the way emotions influence each other over

time, with the ultimate goal of developing personalized therapies (Fisher, 2015).

Attempts to characterize how ratings of emotions are related to each other in idiographic

analyses are thus an expanding area of the emotion literature.

Research on the daily dynamics of emotion is also a rapidly growing field, but

much of the research in this area assumes that the underlying structure of emotional

experience over time is the same as that found in nomothetic analyses (Kuppens,

Oravecz, & Tuerlinckx, 2010; Timmermans, Van Mechelen, & Kuppens, 2010; Chow,

Zu, Shifren, & Zhang, 2011). For example, a set of measures of emotion dynamics—such

as "pulse" and "spin"—have been developed based on the assumption that emotional

experiences can best be conceptualized as points in a circle defined by two axes: valence

and arousal (Timmermans, Van Mechelen, & Kuppens, 2010). This circumplex model of

emotional experience is one among several theories that have emerged from dimension

reduction techniques in variable-centered approaches (Russell, 1980; Yik, Russell, &

Feldman-Barrett, 1999). Theories about the underlying psychological structure of

emotional experiences guide not just the analysis of a particular data set, but also what

researchers choose to ask participants about their experiences—as well as the design and

analysis of experiments in other, related areas (Gendron, Roberson, van der Vyver,

Feldman Barrett, 2014; Kober et al., 2008).

Research on idiographic approaches to personality has demonstrated that it is not safe to assume a variable-centered model will apply to person-centered data (Molenaar, 2004; Cervone, 2005; Mischel & Shoda, 1995). Ergodicity, which is the formal mathematical condition under which variable-centered models and person-centered models will be equivalent, can only be met when examining certain types of processes. For example, cyclic processes violate ergodicity, and so any emotional cycles cannot be captured using a variable-centered model. Similarly, any process where learning or development takes place—for example, people learning to better differentiate or regulate their emotions—cannot be captured by a variable-centered model. If we have reason to suspect that emotion processes violate ergodicity—because they involve cycles, learning, or other temporal changes—then we need to examine the specific structures of individuals' changing emotions. Understanding the way that emotions vary within different individuals might contradict the current paradigms on which new work on emotion dynamics is being built. For example, pulse and spin in emotion ratings depend on using a two-dimensional space that might not adequately characterize most people.

My theoretical proposal is that, just as variable-centered and person-centered approaches to the structure of personality yield different results, so will variable-centered and person-centered approaches to the factor structure of affect. More specifically, I suggest that each person has a distinct structure in their emotional experiences that will not necessarily apply to others. The structure of an individual's emotional experiences describes which emotions they tend to experience together, and how these experiences change over time. For example, one person might experience all positive emotions together—such as enthusiasm, contentment, and pride—while negative emotions are felt

in two distinct groupings—one for negative internal evaluations, such as embarrassment and guilt, and another for negative external evaluations, such as anger and disgust. Knowing that this individual is feeling pride provides information about his other positive states—he is also likely feeling enthusiasm—but not about his negative states. These are separable constructs, which suggest qualitatively different emotional responses.

At a broader level, finding distinct emotional structures for different individuals would change the way we think about emotions theoretically. It would suggest that characterizing a group of people's emotional responding to a single event does not tell us how any specific individual will respond to a new event. To understand how my emotional responses to a tragic news item differ from someone else's, I would want to refer to a variable-centered structure—such as valence and arousal dimensions. To understand how my emotional responses shifted after I heard a tragic news item, I would want to refer to a person-centered structure—which might include valence, arousal, or other dimensions like social and control-oriented emotions. Like personalized medicine, this framework has the potential to lay the groundwork for personalized predictions and interventions (Hamburg & Collins, 2010; Fisher, 2015). Attempts to shift someone out of a depression, to increase feelings of contentment and relaxation, or to anticipate how someone will respond to successes and failures can be based not just on comparison to strangers, but on that person's own emotion structure.

THE CURRENT STUDY

I examined the underlying structure in repeated measurements of subjective emotional experiences. I asked participants to describe two emotional experiences from each day, over the course of 35 days. I examined the individualized structures of each

person's emotional experience using P-technique factor analyses. I compared this to the emotional structures of people in general, by using an R-technique factor analysis (where variables are compared across people). I wanted to determine if the particular emotional lives of individuals differ from the emotional lives of the average or prototypical person at a given point in time. I predict that the structure of emotional experiences over time will differ across individuals, and that these differences will be more complex than those seen when generating a factor structure for the prototypical person at one time point.

METHODS

Participants

A sample of 89 individuals was recruited to participate in this survey. Individuals were recruited via two methods: advertising via social media by the researcher, and offering course credit to undergraduate students in psychology courses. Only participants who had completed at least 30 of the 35 days requested were retained for analysis. This yielded 52 participants whose time series were 60 points or longer. Of these, 19 were undergraduate students and 33 were community members. Of these, 49 participants reported demographic information. This was because three community members opted not to complete the demographic survey sent out at the beginning of the study. The age range was 18 to 70, with a mean of 31.1 years old. There were 17 men and 32 women included in the final sample. Among these, 30 identified as white, six identified as Hispanic/Latino, four identified as East or Southeast Asian, two identified as South Asian, two identified as both Hispanic and East Asian, two identified as white and South Asian, one identified as Middle Eastern, one identified as white and Hispanic, and one identified as white and East Asian.

Measures

Demographics and Personality. Participants reported their age, gender, and ethnicity. They also completed a 10-item version of the Big Five Inventory (Gosling, Rentfrow, & Swann, 2003). This questionnaire captures information about individuals' personality characteristics, based on the Five Factor Model of personality (John & Srivastava, 1999). Personality data are not considered here, but will be made available in the final data set for future research.

Daily Emotions. The measure used in this study was based on prior work on emotions, capturing many proposed basic emotions that vary along theoretically important dimensions. It was also limited in size so that completing the survey would not be too time consuming for participants. The survey asked people: "Please remember a significant moment you experienced **before 2:00 PM today**. This should be a moment that you can remember clearly, including how you felt at the time." Participants were asked to make a brief note about what the event was, using an open-ended text response. Then they rated how much they felt each of 16 emotions on a scale of 1 (not at all) to 10 (one of the strongest times I've felt this emotion). Emotion terms were intended to capture theoretical constructs that may not have been clear to participants. Therefore, I included two words that helped to describe the concept. The emotion words used are given in Table 1. The survey then asked participants to report on a second emotional experience, one have occurred after 2:00 PM.

I referred to events as "significant" as opposed to "emotional" in order to avoid possible associations of the word "emotional" with negative emotional outbursts. I wanted to capture both positive and negative events, and a lay reading of the term emotional might have biased that. Further, based on informal discussions with individuals testing early versions of the survey, I concluded that participants might be likely to report that they did not have any "emotional events" in a given day—but that they would be likely to report that they experienced "significant events." I was attempting to get a range of emotional experiences over time, including events that were not necessarily encoded as "emotional" but that nonetheless had some emotional content. I judged that the word significant would evoke these responses. I asked participants to report two such events from different points during the day to sample from a broader array of typical events.

The emotion words chosen for this study were based on a review of emotion taxonomies developed through empirical and theoretical work. Most of the positive emotion constructs included in the questionnaire are part of the PANACEAS taxonomy developed by Shiota and colleagues (2014), and included in prior research (e.g., Campos et al., 2013). This research includes enthusiasm, pride, contentment, amusement, sexual desire, and two different forms of love. However, less empirical work has been done clearly differentiating these forms of love—one based in being cared for and one based on caring for others—and they are not clearly delineated in English (the distinction is seen in the Japanese term *amae*). Therefore a single term referring to loving/affectionate was included.

Not included in this taxonomy was curiosity/interest and sympathetic/compassionate. However, these emotions have been studied in several other

lines of research. For example interest has been proposed by Izard as a basic emotion (Izard, 2007). Interest has also been related to persistence in work and play (Fredrickson, 1998; Izard, 1991; Silvia, 2006). Sympathy and compassion have similarly been the subject of a great deal of academic research (Goetz, Keltner, & Simon-Thomas, 2010; Eisenberg, 2000). For example, sympathy plays an important role in children's social and moral development (Eisenberg, 2000; Sallquist, Eisenberg, Spinrad, Eggum, & Gaertner, 2009); inhibits neural activity related to anger (Harmon-Jones, Vaughn-Scott, Mohr, Sigelman, & Harmon-Jones, 2004); and has been identified at above-chance levels in facial expressions (Keltner & Buswell, 1996).

The negative emotions similarly were primarily selected to reflect existing theoretical taxonomies. The negative "basic emotions" proposed by Ekman were included: anger, sadness, fear, disgust, and contempt (Ekman, 1992). Also included was embarrassment, a well-studied emotion often included in newer taxonomies of basic emotions (Ekman, 1992; Keltner, 1995). Guilt and shame, other common self-conscious emotion states, have also been studied and distinguished from embarrassment (Tangney, Miller, Flicker, & Barlow, 1996). Finally, jealousy has been considered an important emotion from an evolutionary perspective. Research has found that it can play an important role in regulating interpersonal relationships and has a distinct psychological profile (Hupka, 1984; Sharpsteen, 1993).

These terms are based on a current reading of the emotion literature, with a premium placed on keeping participants' response time to a minimum. The list is not identical to prior lists used in nomothetic research due to differences in length and theoretical orientation. For example, the scales used by Russell (1980), Watson and

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Tellegen (1985), and Thayer (1986), were developed using item lists of 28, 60, and 20 items, respectively. Short forms of these lists exist, but were developed assuming that the underlying two dimensional taxonomies found in larger lists are correct. These item lists are either too long or assume the answer to the question that I am attempting to answer by re-examining the structure of emotion.

At a theoretical level, these lists are also based on a broader reading of emotion to include mood states and terms that current theory might not consider emotions. For example, Thayer's items include wakeful, intense, and sleepy—qualities that are associated with subjective experience, but not necessarily emotions themselves. Similarly, Russell includes terms like bored, sleepy, and at ease, and Watson and Tellegen include terms like determined, alert, and jittery, that are feeling states but not necessarily emotions. These lists also miss many of the emotions that have been the subject of recent research. For example, none includes embarrassment, sexual desire, or jealousy in their lists of items. The list of emotion terms I developed here is informed by theoretical considerations and empirical work not available at the time when these previous lists were developed.

Procedures. Participants who were contacted via email or social media about the study were directed to an introductory survey where they read a detailed description of the study and provided information about their demographic details and completed the 10-item Big Five Inventory. They also provided an email address they were comfortable being contacted at for the duration of the study. Undergraduate participants had access to the introductory survey via the SONA systems psychology participation website

administered by Arizona State University. If they completed the introductory survey and provided an email at which to be contacted, then they were included in the study.

Once the participants had consented and provided an email at which to be contacted, they were sent daily surveys for 35 days. In each survey, participants were asked to fill out the emotion questionnaire described above. The survey was administered via the Qualtrics survey software, and automated to send to all participants at 5:00 PM every day. Participants were sent a new survey link to complete every day, until they had completed the 35 days. A few participants volunteered to continue completing the survey for a few extra days, because they had missed one or more surveys earlier in the month.

RESULTS

To understand the underlying structure of the emotion ratings, I conducted variable-focused factor analyses (R-technique) on the data from many participants at a single point in time, comparing across people. Then I conducted person-focused factor analyses (P-technique) on the data from each participant, comparing a single person's ratings across time. The goal of factor analysis is to uncover a small number of underlying factors that account for a majority of the shared variation in a set of items.

P-technique factor analysis assumes that data points are independent and identically distributed (Cattell, Cattell, & Rhymer, 1947; Molenaar & Nesselroade, 2012). In the case of the data collected here, a P-technique factor analysis assumes that each emotional event reported on by a participant is independent of all the others, without any lingering effects from the previous emotional event. I tested this assumption using the Ljung-Box test of stationarity, which estimates whether the correlation seen between a measurement at one time point and the next is greater than would be expected by

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chance. For 703 of the 819 time series analyzed, the test was non-significant, indicating that the assumption of stationarity was likely justified. This means that when lingering effects from one time point to the next were estimated, for the majority of data these effects were so small as to be not significantly different from zero. I chose to analyze all of the time series using the P-technique, even though some of the time series were non-stationary, because recent simulation research found that the P-technique can correctly uncover the factor structure of a time series even if there are autocorrelations in the data (Molenaar & Nesselroade, 2009; Lo, Molenaar, & Rovine, 2016).

Factor analyses were conducted using the minimum residual (OLS) factor method with oblimin rotation. Oblimin is an oblique rotation criterion that tries to simplify the structure obtained in factor analysis by minimizing the cross products of the loadings. This rotation is commonly applied to make factor structures more interpretable. The number of factors to retain in exploratory factor analysis was determined using Horn's parallel test (Horn, 1965). This test creates new data sets of the same size with randomly generated numbers. The eigen values that would be obtained from random data are compared to the eigen values for the observed data. All factors with eigen values greater than what would be expected due to chance are retained.

Several models had problems converging, due to the presence of a Heywood case. Heywood cases occur when the model estimates that a series of factors will account for greater than 100% of the common variation in a particular item (e.g. the two factors valence and arousal account for 110% of the variation in ratings of anger). This result does not make sense theoretically, and so researchers suggest not interpreting models with Heywood cases, but instead altering the model so that a Heywood case does not

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occur. The causes of Heywood cases include not having enough data to estimate a model, choosing the wrong number of factors (either too many or too few), or using bad initial estimates of communalities. Oblique rotations also increase the likelihood of getting Heywood cases.

When any of the factor analyses I performed had a Heywood case, I examined models with one to six different factors. I found the models that did not have Heywood cases associated with them, and from these chose the one with the smallest Bayesian Information Criteria (BIC) value. BIC is an index of model fit that penalizes complexity, so the improvement in fit from having a model with more factors is traded off against the fact that having more factors makes the model more complex.

Results of Variable-Centered Factor Analyses

In order to establish a comparison point for the person-centered approach, I first conducted factor analyses on emotional experiences at each time point. In these factor analyses, all the ratings made by participants on a particular day and at a particular time (before or after 2:00 PM) were compared. I chose to include only days when more than 40 participants were participating, because estimating the models with fewer data points might lead to issues with convergence. For the same reason, I omitted variables that had very low variability on a particular day ($SD < .20$). Factor analyses for a total of 74 time points were retained.

According to this criterion, 35 of 74 time points (47%) had a two-factor structure, 26 of 74 (35%) had a three-factor structure, 12 of 74 (16%) had a four-factor structure, and 1 of 74 (1%) had a five-factor structure. No time points had one-factor structures or

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more than five factors. I also examined whether there were differences according to time of day, morning (before 2 PM) and evening (after 2 PM). A Welch's two sample t-test comparing means was non-significant (t (65.56) = 1.160, p = 0.250). The mean number of factors for the morning was 2.54, and for the afternoon was 2.76. Additionally, the number of participants responding on any given day was not significantly related to the number of factors (b = 0.008, t (66) = 0.833, p = .408). Using a one-factor ANOVA, I also found that the number of factors was also unrelated to the day of the week being tested (F (6, 61) = 0.515, p = 0.795). The average root mean squared error of approximation (RMSEA) was 0.133, and the average amount of variance accounted for by the factors extracted in the models was 57.5%.

To understand the factor structures obtained in the data, I examined the pattern of factor loadings for each day. I labeled each factor based on the items that loaded most highly on that factor. On every day where two factors best fit the data, one factor corresponded to positive emotion and one corresponded to negative emotion. Positive emotions included amusement, enthusiasm, contentment, pride, curiosity, love, and sympathy. Negative emotions included contempt, jealousy, disgust, anxiety, embarrassment, anger, guilt, and sadness. An example of a model fitting this pattern is given in Figure 1. These models are labeled Group 1 in Table 2.

There were a few cases where all the positive emotions and negative emotions did not divide perfectly. In four models, one negative emotion had a negative factor loading on the positivity factor. These emotions were contempt (twice), anger, and sadness. In these cases, ratings of the particular negative emotion were more closely related to feeling low positivity than to feeling high on other negative emotions. Additionally,

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feelings of sexual desire loaded positively with positive emotions in 14 of 35 two-factor solutions, and positively with negative emotions in 11 of 35 two-factor solutions. In the other models, it did not load highly on any factor. This means that people in the sample were roughly evenly split in whether they experienced sexual desire with positive emotions, with negative emotions, or without either.

In 18 of the 26 three factor solutions, there were factors corresponding to internal negative and external negative emotions. I labeled these factors internal and external following the developmental literature, which suggests that children tend to either focus negative emotionality towards themselves (internalizing) or towards others (externalizing; Birkley & Eckhardt, 2015; Zahn-Waxler, 2010). The internal negative emotion factors typically had guilt and embarrassment among their highest loading items, and often included anxiety and depression. In five solutions, sexual desire was also associated with internal negative emotions. The external negative emotion solution typically included feeling contempt, offended, and angry. In some cases it also included jealousy, and in four cases it included feeling depressed. An example of this factor structure is given in Figure 2. These models are labeled Group 2 in Table 2.

In eight of the 26 three factor solutions, there was a positivity factor, a negativity factor, and a factor related to romantic relationships. The positivity factors included items like contentment, enthusiasm, pride, amusement, and curiosity. The negativity factors included items like disgust, contempt, jealousy, embarrassment, anger, anxiety, and sadness. The romantic relationships factor included love, sympathy, and sexual desire. In one case, curiosity was also included with love, sympathy, and desire. In another case, only love and sexual desire were part of the romantic relationship factor, while sympathy

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loaded on the positivity factor. In this model, high positivity was also associated with low anger. An example of this factor structure is given in Figure 3. These models are labeled Group 3 in Table 2.

All of the four factor solutions had the same set of four factors: one corresponding to positive emotion generally, one corresponding to positive emotion surrounding a romantic relationship, one corresponding to internal negative emotion, and one corresponding to external negative emotion. These solutions split the positive and negative emotion factors into two separate parts. Positive emotions related to romantic relationships were distinguished from other positive emotions, and negative emotions related to blame by others were distinguished from other negative emotions. An example of this factor structure is given in Figure 4. These models are labeled Group 4 in Table 2.

The factor analyses of self-reported emotion comparing many individuals at one time point is the typical approach to studying subjective emotional experience. Prior literature on emotion has suggested several different two factor solutions for emotion rating data. One solution consists of valence and arousal factors (Russell, 1980), another consists of positive and negative factors (Watson & Tellgen, 1985), and a third consists of tension and energy (Thayer, 1989). My analyses thus suggest that Watson and Tellegen's model was most commonly seen when asking individuals about recent significant events.

All of the three factor solutions retained positive versus negative distinctions, but 31 of 74 (42%) of them also split negative emotional experiences according to those that were directed externally—like disgusted/offended, rejecting/contempt, jealousy, and anger—and those that were directed inward—like guilt, embarrassment, anxiety, and

depression. 21 of the 74 factor solutions (28%) included factors that were centered around terms related to romantic relationships, such as love, sexual desire, and sympathy. Prior research that found three factors in the structure of emotion labeled their structures valence, potency, and arousal (Osgood, May, & Miron, 1975). These labels do not clearly apply to the three factor solutions I identified. No potency or arousal factors were uncovered, and valence was split into two factors.

Results of Person-Centered Factor Analyses

For the P-technique factor analysis, all emotions with low variability ($SD < .20$) over the course of the 60 or more days were removed. Among the 52 time series, jealousy was removed 11 times, sexual desire was removed eight times, contempt was removed four times, and embarrassment, guilt, and disgust were each removed once. As with the variable-centered factor analysis, the correct number of factors was decided using Horn's parallel test. In the final sample, there were 22 participants (42%) whose data was fit by a two factor structure; 12 (23%) whose data was fit by a three factor structure; 9 whose data was fit by a four factor structure (17%); seven whose data was fit by a one factor structure (13%); and two whose data was fit by a five factor structure (4%).

Among males, 41% had a two factor structure, 24% had one factor, 12% had three factors, 12% had four factors, and 12% had five factors. Among women, 44% had a two factor structure, 24% had three, 20% had four, and 12% had one. There was greater variability among males than females in terms of factor structures, but a chi-square test for the difference between these groups was not significant ($\chi^2 (4) = 4.97$, $p = .290$). Additionally, a linear regression predicting number of factors from age was not

significant (F (1, 39) = 0.473, p = .496). Being from the undergraduate versus community sample was also not a significant predictor of number of factors (F (1, 40) = 0.548, p = .464). The average RMSEA for all models was 0.136, and the average amount of variation accounted for was 53.5%.

In the seven cases where only one factor was found, the factor was always valence. Positive items would all load in one direction (e.g. contentment, enthusiasm, curiosity), while negative items would load in the other direction (e.g. depression, anger, anxiety). An example of a one factor solution is given in Figure 5. This is labeled Group 1 in Table 3.

Among the 22 two factor solutions, nine had one factor that corresponded to valence and another that corresponded to romantic relationships. Romantic relationship related items included love, sympathy, desire, and jealousy. Among these, two included positive loadings from negative emotion items: jealousy and embarrassment. For these two models, feeling love and sympathy was also associated with feeling jealousy or embarrassment. Additionally, two models had negative emotion terms with negative loadings. In one case, when love and sexual desire were high, contempt, disgust, and anger were low. In the other case, when love and sympathy were high, disgust and contempt were low. An example of one of these models is given in Figure 6. These models are labeled Group 2 in Table 3.

Five of the 22 two factor solutions involved one valence factor and a second factor centered on external negative emotions. The external negative emotion factor typically included disgust, contempt, and anger. In two cases, it also included jealousy. In one case, feeling high external negative emotion was associated with feeling low

curiosity and amusement. An example of one of these models is given in Figure 7. These models are labeled Group 3 in Table 3.

Eight of the 22 two factor solutions involved a positivity and a negativity factor. These corresponded to the positivity and negativity factors seen in most variable-centered analyses. In one case, being high on positive emotions was associated with being low on sadness. In another case, being high on negative emotion was associated with being low on amusement. Being high on negative emotion was associated with being low on pride in another model. In two models, being high on negative emotion was associated with being low on pride and contentment. An example of one of these models is given in Figure 8. These models are labeled Group 4 in Table 3.

Six of the 12 three factor solutions included a positive factor, a negative factor, and a romantic relationship factor. These factors were comparable to similar factors seen in the two factor models. The core of the positivity factor was pride, contentment, enthusiasm, and curiosity. In one case, positivity was associated with low contempt and disgust. The core of the negativity factor was disgust, jealousy, guilt, fear, sadness, and embarrassment. In one case, negativity was associated with low contentment and pride. The core of the romantic relationship factor was love and sex, but amusement and sympathy were also in some of these factors. One relationship factor was associated with low anger, one with low contempt, and one with higher depression. An example of one of these models is given in Figure 9. These models are labeled Group 5 in Table 3.

Six of the 12 three factor solutions included a positive factor, an internal negative factor, and an external negative factor. The positive factor was comparable to those previous described, although love was associated with it. Sex commonly shared so little

variance with other emotions in these models that it did not load with any factor. The internal negative factor reflected negative feelings turned inward, and was focused around guilt, embarrassment, and depression. The external negative factor reflected negative feelings turned outward, and was focused on contempt, disgust, and anger. An example of one of these models is given in Figure 10. These models are labeled Group 6 in Table 3.

In the most common four factor solution, there was a positive factor, an external negative factor, an internal negative factor, and a romantic relationship factor. This was seen in seven of the nine four-factor solutions. The positivity factor included items like amusement, pride, curiosity, enthusiasm, and contentment. The external negative factor included items like contempt, disgust, anger, and jealousy. The internal negative factor included items like embarrassment, guilt, anxiety, and depression. The romantic relationship factor included items like love, sex, and sympathy. An example of this factor structure is given in Figure 11. This structure is labeled Group 7 in Table 3.

Two individuals had four factor structures with two positive and two negative factors. These factor structures were unusual, and did not directly match each other. Participant 28's two positive emotion factors included (1) pride, enthusiasm, contentment, and love, and (2) curiosity and amusement. Participant 18's two positive emotion factors, on the other hand, included all positive emotions except sympathy, with sympathy loading on its own separate factor. The negative emotion factors also did not match each other well. Participant 28's two negative factors included (1) sadness, guilt, fear, and sympathy, and (2) anger, disgust, and contempt. Participant 18's two negative factors included (1) guilt and anger, and (2) fear, sadness, and disgust. These two unusual

four factor structures are labeled Group 8 in Table 3. The factor structure for Participant 28 is displayed in Figure 12.

Two individuals had five factor solutions. These factors were positive, which included pride, contentment, and enthusiasm; external negative, which included anger and disgust; romantic relationships, which included love and sex; an internal negative factor with anxiety; and an internal negative factor with guilt. These two factor structures are labeled Group 9 in Table 3. An example of this factor structure is given in Figure 13.

DISCUSSION

The idiographic analyses yielded different emotion structures than the nomothetic analyses. The majority of nomothetic analyses (53%) led to a well-established two factor solution, with clear positivity and negativity factors. This solution was only seen in 15% of the idiographic factor analyses. While the nomothetic analyses included only one type of two factor structure, the idiographic analyses included three qualitatively different types of two factor solutions. The idiographic analyses also included simpler structures— one factor solutions—than those seen in nomothetic analyses. These analyses reveal that the structure of emotional responding seen when comparing people to each other at one time point does not correspond to the structure seen when comparing one person to him or herself at multiple time points. There are important differences between people in what underlying dimensions appear to be guiding their emotional responses, and these individualized dimensions are more varied than those seen in nomothetic analyses.

The content of the underlying dimensions seen in the idiographic analyses also differed qualitatively from those seen in the nomothetic analyses. Although only 24% of

the nomothetic analyses included a factor related to romantic relationships, 42% of the idiographic analyses included a romantic relationships factor. Having a separate relationship-focused factor was the most common solution for two, three, and four factor models. Although not all earlier attempts to uncover dimensions of emotion included words related to social emotions (e.g., Thayer, 1989), those that did have not uncovered specific factors related to close relationships (e.g. Fontaine et al., 2007; Watson & Tellegen, 1985). This analysis is the first I have encountered in my review of the literature that includes such clear evidence for a relationship factor.

This dimension would not have emerged as an important theme had it not been present in so many idiographic models. Nomothetic analyses suggest that the most common conceptual cut to make is between positivity and negativity, but idiographic analyses suggest that the most common conceptual cut to make is between valence and relationship-focused emotions. If early emotion researchers had begun by analyzing the emotions of specific individuals over time, instead of analyzing "snapshots" of emotion in many people, then the core space in emotion theory might look quite different. Instead of valence versus arousal or positivity versus negativity, it would be a valence versus relationship space, illustrated in Figure 14. However, respecting idiographic principles, this distinction would be treated as common—but not universal.

The differences between idiographic and nomothetic analyses of emotion suggest that emotion theory should be updated. One core theoretical question that deserves further investigation is what causes these idiographic differences. The answer to this question depends, in part, on what self-reported emotions are taken to measure. There has been much debate over this question in the literature, and certain theoretical perspectives

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tend to favor different interpretations (Barrett, 2004; Frijda, 2009; Ortony, Clore, &
Collins, 1988). Basic emotion approaches suggest that emotional subsystems exist
independent of an individual's ability report having them, and that differentiated self-
reports represent skill in introspection; on the other hand, cultural constructivist
approaches suggest that emotions categories are created when an individual learns to
associate certain states with a word, and so more or less differentiated self-reports
represent whether individuals actually feel more or fewer emotion categories (Barrett,
2006b). The implications of this study thus depend on other theoretical commitments.

The cultural constructivist perspective emphasizes a "realist" approach to self-
reports, which suggests that people's emotional experiences are how they report them—
people aren't wrong about what they're feeling. From this perspective, if an individual
does not have a particular factor—for example, one individual's analysis does not involve
internal and external negative factors—then those underlying dimensions simply do not
exist for that person. The differences in dimensions are the result of real differences
between people. Constructivist researchers have suggested that all that is basic—meaning
that which is inherited in the form of largely fixed, biologically distinct subsystems—are
the underlying dimensions seen in emotion self-reports. However, these were based on
nomothetic analyses. By analogy, a constructivist perspective might suggest that all that
is biologically basic in an idiographic analysis is the specific person's underlying
dimensions. Some individuals might inherit only a single subsystem, which codes for
valence, while others might inherit four subsystems, corresponding to positivity, internal
and external negativity, and romantic relationship-focused emotions. Further

differences—such as residual variation in anger, disgust, and contempt not explained by the common external negativity factor—would be due to learned concepts.

Another realist approach to self-reports of emotion might suggest that the differences in factor structures are due to constructed emotion dimensions. This approach would be a departure from the conceptual act model and related accounts of emotion, because these models have assumed that the underlying dimensions in self-reports *do* represent some basic underlying biological reality (Barrett, 2006b; Russell, 2003). If even the "core affect" dimensions are cultural constructions, then emotions might be considered cultural "all the way down." In other words, all the significant differences between emotions—including distinctions between valence and arousal—are created through learned associations between words, situations, behaviors, and physiological responses. These created categories might be thought of as existing in a two-level hierarchy. Higher order conceptual categorizations, such as external negativity, might correspond to the uncovered factors, while lower order categorizations, such as love or desire, would correspond to the unique variation in items not accounted for by the factors. Similar "emotion families" have been proposed in prior emotion literature (Ekman, 1992; Scherer, 2009; Shaver, Schwartz, Kirson, & O'Connor, 1987). This approach would suggest the people develop hierarchical conceptualizations of emotion, but there is considerable variability in which higher order categories are learned.

In this "pure constructivist" approach, it is possible that a single valence dimension is still considered basic—no models were found that did not include this distinction—but every distinction made beyond that would be the result of strengthening associations between various aspects of emotional experience. The alternate realist

approach that suggests deep biological differences in emotion systems, which would be a radical departure from much prior emotion theorizing. However, evolutionary models are based on competition among phenotypes within the same species (McElreath & Boyd, 2007). If different sets of emotion subsystems have varying fitness consequences that depend on their environment, then people's heterogeneity in emotion subsystems can be considered "adaptive bets" about which emotional distinctions will be most useful for navigating their environments. In either case, it is clear that constructivist perspectives on emotion needs some modification to account for the significant variability between people in emotion structures.

Another possibility is that people's self-reports of emotions are imperfect, not fully capturing what is going on within her or himself. Someone might say "I'm not angry," even though that person really *is* angry (Frijda, 2009). Certain people may be better (or more honest) in reporting their emotions, and so a plausible explanation in differences in underlying structures are individual differences in conceptual knowledge or ability to attend to their own internal processes. This perspective on self-reports is commonly associated with basic emotion approaches, although it can be associated with appraisal research (Barrett, 2006; Frijda, 2009; Tooby & Cosmides, 2008). Under this interpretation self-reports do not necessarily reflect an underlying biological or psychological reality. Individuals might therefore all have the same underlying emotion systems operating, but the difference would just be due to an individual not being able to clearly articulate on the self-report form how their experiences are different from each other.

A self-report "relativist" might interpret the results of this study by emphasizing individual differences in the ability to accurately perceive real, underlying differences between emotion structures. For individuals who do not have strong differentiation of emotions—for example, those individuals who only have a valence factor—the biological program corresponding to anger might still be leading to distinctive cognitive processes and behavioral tendencies, but they do not make as clear distinctions at a conscious, conceptual level (Scherer, 2009). Considering conceptual knowledge about emotions might therefore help to account for these differences.

Much of the work on individual differences in the ability to report on emotion states has come from a cultural constructivist perspective (Barrett, 1995; 2004; Lindquist & Barrett, 2008). Research on emotion granularity assumes that valence and arousal are the core dimensions of emotional experience, so it does not test why different structures might arise. However, one series of studies did examine the degree to which linguistic differentiation in affect words—the degree to which an individual distinguishes among valence and arousal words, assessed by asking participants how similar the word are— relates to self-reported emotion (Barrett, 2004). Making a greater linguistic distinction between arousal words was significantly related to differentiating between arousal-related emotion terms when reporting on emotion experiences. Results were inconsistent for linguistic distinctions between valence words—they were only related to self-reported valence experiences in one of three studies. The overall pattern, however, suggests that language knowledge is related to self-reports of emotion. Individuals who only have a valence factor in their idiographic model might therefore be experiencing a complex set of emotion dimensions, but not know exactly how to describe these differences using the

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emotion words given. If these individuals were to learn about emotional differences and practice identifying them in their everyday experiences, then their idiographic emotion structure might become more complex.

Finally, it is possible to interpret the results of this study from a situation-focused lens. There may be a rich array of emotion subsystems, each of which is operating independently, but the situations in which an individual commonly finds herself might cause correlations among activation of these systems. For example, if a person has a negative relationship with a coworker, seeing the coworker might cause contempt, disgust, and anger. Because this person sees their coworker every day, contempt, disgust, and anger are often experienced together. This would be identified as an external negative factor through the analysis. However, the presence of this factor would not necessarily be due to a common biological substrate for these emotions; each might be entirely separate systems. Nor would presence of this factor be due to an inability to accurately describe emotional experiences; each of these different emotions may be felt and reported with perfect accuracy. Instead, the presence of the factor would be due to the commonly recurring situation. This interpretation of my results therefore is compatible with a "realist" perspective on self-reports and a basic emotions perspective.

This situation-driven account of idiographic structures could also be compatible with a constructivist account of emotion categories. Scherer (2009), in reviewing research on category development, suggests that emotion categories are developed by individuals to capture important distinctions necessary for navigating the world while at the same time maintaining "cognitive economy" by limiting categories to a manageable scope. Because this constructivist perspective emphasizes the contextually situated needs of a

particular person in their environment, it suggests that people living in different environments—for example, one in an environment with pleasant coworkers, one in an environment with unpleasant coworkers—might learn to make different distinctions among emotions. An individual with only a valence dimension might find that only a positive-to-negative evaluation of their daily experiences is necessary for successfully getting around. An individual with a valence dimension and a romantic relationship dimension might find that positive-to-negative and loving-to-not loving dimensions are necessary to make sense of their daily experiences. These two individuals have constructed different schemes for categorizing their emotions, based on the needs of their environment. The constructed schemes might be updated as each person's life—and needs—change.

Interpreting emotion structures as primarily situationally driven suggests the idiographic factor structures reflect the typical situations individuals find themselves in, as opposed to the complete set of psychological and biological responses associated with emotions. Idiographic emotion structures might thus be another way of developing taxonomies of situations, an area of recent interest in social and personality psychology (Rauthmann et al., 2014; Brown, Neel, & Sherman, 2015). These structures might represent the emotional landscape that individuals typically experience in their lives. Practically, this interpretation suggests that a successful intervention to change an individual's emotion structure would involve changing the pattern of that person's day-to-day life. This follows from systems theory, which suggests that sets of variables are all interconnected and mutually influencing, and therefore that interventions—even those that influence just one element of a system—are likely to reconfigure the entire pattern of

the system (Fisher, 2015; Mischel & Shoda, 1995; Richardson, Dale, & Marsh, 2013; Schmittmann et al., 2013). Repairing an unhappy relationship, therefore, might not only reduce certain negative emotions, but change the underlying relations among emotions so that a positive romantic relationships factor emerges—or a negative external factor disappears.

The idiographic approach therefore also suggests new directions for basic emotion research. People clearly do not all report their emotions using the same set of dimensions, and this variability among people needs to be accounted for by basic emotion theory. One way to do this would be to extend important work on emotion language and differentiation using a different conceptual framework (Barrett, 2004; Lindquist & Barrett, 2008). Understanding how different people use emotion language, including how they have learned to share their internal experiences with others, can thus be recast. Differences in emotion dimensions would not suggest that concepts are being constructed out of otherwise unrelated components, but that the individual is developing a keener ability to detect real differences in her own psychology. This alternative conception of emotion language and concepts would be supported by finding that certain divisions are more likely to occur among emotions, but others are highly unlikely. This would suggest that those underlying emotion systems that are most similar are likely to be grouped together, because individuals are learning to recognize real associations between these systems (for a phylogenetic interpretation of these associations, see Shiota et al., in press). For example, love and desire are related subsystems, so individuals are likely to develop a romantic relationships factor. On the other hand, disgust and desire are less closely related subsystems, so they are less likely to load on a common factor.

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The idiographic approach also emphasizes the interaction of person and environment in generating emotions. How and why individuals learn to make conceptual distinctions in self-reports can be considered functional questions about a person's ecology (Scherer, 2009). Do people strategically fail to distinguish between internal and external negative emotions to avoid conflict with others? Do people who distinguish relationship-focused emotions from others do a better job of maintaining close relationships? These questions emphasize differences in the structure of the individual's daily life—the common threats and opportunities that the particular person faces—when considering her emotional self-reports.

The results of idiographic analyses of emotion lead to a richer emotion theory, but they do not necessarily obviate nomothetic analyses. Analyses should be based on the questions the researcher is attempting to answer, and there may be instances where traditional nomothetic analyses are preferred. For example, if an individual was interested in the average emotional response of many individuals to a particular film, Watson and Tellegen's (1985) positive and negative affect factors may be appropriate. These dimensions might describe the types of responses many people feel while watching it. However, they will not describe the way that a specific individual's emotions change while watching the film.

However, it is clear that when attempting to characterize the core dimensions of emotional experiences, nomothetic and idiographic approaches do not yield the same structures. As I demonstrated empirically, only a few specific individuals match traditional two factor models of emotion (e.g. Watson & Tellegen, 1985). Three factor models of emotion, which typically include a valence, arousal, and potency/control

factor, also do not appear to adequately describe the person-specific models uncovered (Osgood, May, & Miron, 1975). The distinctions between internal and external negative emotions do not directly map onto either the arousal or potency/control factors, and there is no place for emotions specific to relationships. This social dimension is also missing from Fontaine and colleagues' (2007) four factor model of valence, potency, arousal, and unpredictability. In fact, unpredictability was not found as a factor for any of the person-specific or variable-specific models. None of the established nomothetic models of emotion correspond well to the various idiographic models found in this data. Asking questions based on any of the established nomothetic factor structures fails to capture the important distinctions in daily emotional experiences for most people.

Finding individual differences in idiographic structures suggests many directions for further research. One approach has been to attempt to unify idiographic and nomothetic analyses. Molenaar's research group has developed an algorithm called GIMME that combines idiographic and nomothetic analyses to uncover subgroups of individuals with different patterns of neural responses to the same stimuli (Gates & Molenaar, 2012; Yang, Gates, Molenaar, & Li, 2015). This approach is an extension of structural equation modeling, with separate structural equation models developed for all individuals, and then equivalence of paths in different individuals being tested. Gates and colleagues (2014) analyzed a sample of 80 children diagnosed with attention deficit hyperactivity disorder (ADHD) using the GIMME algorithm and found five subgroups based on brain functioning. For example, individuals in Group A had higher than average connectivity from the right inferior parietal lobule to the left inferior parietal lobule. This connection from right to left inferior parietal lobules was below average in Group B. No

single pattern characterized the brain functioning of all individuals. Although there was a nomothetic similarity among these individuals—diagnosis with ADHD—there were also important idiographic differences among them based on underlying patterns of functional neural connectivity

This approach suggests that emotions in the brain, like emotions in self-report, might have different underlying structures. For example, individuals all viewing the same frightening images (and all reporting similar levels of fear) might nonetheless be processing these emotions using a different set of underlying connections among brain regions. The GIMME algorithm demonstrates a statistically rigorous way of respecting the primacy of idiographic analysis. Individuals are compared to themselves, to uncover the consistent patterns in their behaviors and functioning over time. It is similarities among these patterns that are the basis for generalization.

This combined idiographic and nomothetic approach has also been applied to daily diary measures of subjective states, and is a useful future direction for examining daily diaries of self-reported emotion. Beltz and colleagues (2016) analyzed 100 time points of daily diary data from women diagnosed with a personality disorder. They used four variables that had been previously established as existing at the within-subject level: negative affect, detachment, disinhibition, and hostility. They found that there are common effects for all individuals leading from negative affect to detachment and disinhibition to hostility. However, there are also certain relations that only occur for subsets of individuals. For example, in two of the four subgroups individuals had a lagged relation from hostility to negative affect, meaning that hostility at an earlier time point was associated with higher negative affect at a subsequent time point for some—but

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not all—patients. With more data, this approach might fruitfully be applied to daily diary measures attempting to uncover different underlying structures of emotional responding.

The person-centered approach also has important therapeutic applications. For example, Aaron Fisher (2015) describes how an idiographic approach to emotion might help clinicians develop personalized treatments for mood disorders. In this paper, he suggests that clinicians should measure the specific inputs that lead to disorders over time, and then subject the measurements to idiographic analyses, including P-technique and DFA. These analyses can help the clinician determine what inputs lead to negative outcomes, and thereby target treatment based on the individual client's needs. For example, Fisher analyzed data from 10 different individuals diagnosed with generalized anxiety disorder and found that different individuals had different underlying factors, including worry, avoidance, procrastination, and irritability. He then examined the relationships between these factors over time. In one individual avoidance prospectively predicted worry, so that avoiding problems led to more worry in the future. In another participant, the relationship was reversed: worry predicted more avoidance in the future. Based on this knowledge, Fisher suggests different treatment strategies for these individuals.

Understanding individualized structures of emotion might similarly be used to identify specific emotion regulation strategies tailored to the person using them. For example, Participant 4 in this study tended to feel low sadness and anxiety when experiencing high positive emotions, such as contentment, pride, enthusiasm, curiosity, and amusement. Distracting this person on a sad day with a funny movie or fun evening out might be a good regulation strategy. On the other hand, Participant 51 tended to

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experience sadness and anxiety with feelings of guilt and embarrassment—and these were all independent of feeling positive emotions. To help this person deal with a sad day, it might be helpful to address negative feelings related to social roles. By reducing guilt and embarrassment, sadness would also be reduced. Idiographic analyses, like the kind I presented here, could be used not just to help clinical populations, but to help healthy individuals better understand and deal with their emotions.

There are several limitations to this study. P-technique does not model how the underlying emotion factors change over time. A natural extension of this analysis is Dynamic Factor Analysis (DFA; Molenaar, 1985), which estimates how levels of constructs at one time point influence levels of constructs at the next time point. This would more directly assess the dynamics of emotion by identifying how shifts on one emotional dimension influence all the other emotion dimensions. However, researchers suggest that 100 time points is a rough minimum needed for good estimates of DFA models (Ram, Brose, & Molenaar, 2013), while P-technique factor analyses have been reported with as few as 50 time points (Molenaar & Nesselroade, 2009). Given the data I collected, with many time series being as short as 60 points, P-technique, but not DFA models, are feasible. However, collecting longer time series would allow for the estimation of more complex models and potentially yield better understanding of the emotional dynamics in different individuals.

Another limitation of this study was the sample. To assess whether there are systemic differences in the number of emotion factors experienced by individuals based on specific groupings—such as age, gender, or community versus college sample—a between-subjects analysis must be performed. Given only 52 individuals, my power to

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detect real differences between these groupings was low, and so the finding that there are no differences should be regarded as provisional until further data can be collected. Additionally, a more diverse sample of individuals, in terms of ethnicity, socio-economic status, and cultural background, would allow for the comparison of emotional experiences across a broader range of groups. There might be important differences in the underlying structures of emotional experience across different cultural groups; for example, East Asians subjective experiences of emotion might differ from those of European Americans. This presents an interesting future direction for research.

The dominant paradigm in psychology research compares people to each other at one specific moment of measurement. The way these data are collected and analyzed relies on the assumption that all people in a population have the same underlying psychological structures. However, human beings constantly change. Over the course of thousands of moments perceiving, reacting, and thinking we slowly adapt to our surroundings. We are the product of the continual, repeated interplay of genes, environment, and culture. As such, human phenotypes may differ in deep and significant ways. Although past research efforts might have considered the philosophical limitations of assuming common psychological structures for all individuals, new developments in research methods can demonstrate the empirical relevance of these concerns (Molenaar & Campbell, 2009). By measuring the same individual repeatedly and applying person-centered models, we can quantify the structural differences among people. Comparing people to themselves over time can then allow us to understand how people navigate, adapt, and develop in a rich, changing world. This study demonstrates how the emotional

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lives of individuals in the world are more varied than a single snapshot of emotions can

capture.

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Table 1: Emotion Words in Questionnaire

Enthusiastic/Excited
Proud/Confident
Curious/Interested
Contented/Satisfied
Amused/Playful
Sympathetic/Compassionate
Angry/Annoyed
Jealous/Controlling
Guilty/Ashamed
Sad/Depressed
Anxious/Frightened
Embarrassed/Awkward
Romantic/Sexual
Loving/Affectionate
Disgusted/Offended
Contemptuous/Rejecting

Table 2: Variable-Centered Analyses Organized by Group

Group 1: Positivity Factor and Negativity Factor			
Day	Time	Factor 1	Factor 2
15-Mar	Evening	Amu/Enth/Pri/Cont/Curi/Love/Symp low Rej	Depr/Guilt/Emb/Anx/Jeal/Disg/Ang
15-Mar	Morning	Enth/Pri/Amu/Curi/Cont/Symp/Love/Sex low Ang	Guilt/Emb/Rej/Anx/Disg/Depr/Jeal
16-Mar	Morning	Enth/Curi/Amu/Pri/Cont/Sex/Symp/Love	Disg/Rej/Ang/Jeal/Guilt/Depr/Emb/Anx
17-Mar	Morning	Pri/Curi/Cont/Enth/Amu/Symp/Love/Sex	Depr/Anx/Emb/Jeal/Rej/Ang/Guilt/Disg
18-Mar	Evening	Enth/Pri/Amu/Cont/Symp/Love/Curi/Sex	Jeal/Depr/Ang/Disg/Guilt/Emb/Rej/Anx
18-Mar	Morning	Pri/Enth/Cont/Amu/Curi/Symp/Love/Sex	Rej/Jeal/Disg/Guilt/Emb/Depr/Ang/Anx
19-Mar	Morning	Enth/Amu/Cont/Curi/Pri/Love/Symp/Sex	Disg/Rej/Ang/Depr/Jeal/Emb/Anx/Guilt
20-Mar	Evening	Enth/Cont/Pri/Amu/Curi/Symp/Love	Rej/Disg/Emb/Anx/Depr/Guilt/Jeal/Sex/Ang
21-Mar	Evening	Enth/Amu/Cont/Pri/Curi/Love/Symp	Depr/Rej/Emb/Anx/Disg/Guilt/Sex/Jeal/Ang
21-Mar	Morning	Pri/Cont/Curi/Amu/Enth/Symp/Love	Jeal/Depr/Guilt/Emb/Rej/Ang/Disg/Anx/Sex
23-Mar	Evening	Cont/Enth/Amu/Pri/Curi/Symp/Love	Jeal/Emb/Depr/Guilt/Ang/Anx/Disg/Rej/Sex

23-Mar	Morning	Enth/Cont/Pri/Amu/Curi/Symp/Love	Depr/Jeal/Rej/Disg/Anx/Guilt/Emb/Ang/Sex
25-Mar	Morning	Enth/Pri/Cont/Amu/Curi/Love/Symp/Sex	Disg/Guilt/Jeal/Emb/Depr/Ang/Rej/Anx
27-Mar	Evening	Enth/Pri/Cont/Amu/Curi/Sex/Love/Symp	Rej/Disg/Emb/Jeal/Guilt/Ang/Anx/Depr
27-Mar	Morning	Enth/Curi/Cont/Amu/Pri/Love/Symp	Rej/Jeal/Disg/Ang/Emb/Anx/Guilt/Depr/Sex
29-Mar	Morning	Amu/Curi/Enth/Cont/Pri/Symp/Love/Sex	Depr/Anx/Ang/Guilt/Emb/ Disg/Rej/Jeal
3-Apr	Morning	Amu/Enth/Pri/Cont/Curi/Symp/Love	Rej/Disg/Jeal/Depr/Anx/Guilt/Ang/Emb/Sex
4-Apr	Evening	Enth/Cont/Amu/Pri/Curi/Love/Symp	Anx/Emb/Depr/Guilt/Jeal/Rej/Disg/Ang
4-Apr	Morning	Amu/Enth/Pri/Love/Cont/Symp/Curi/Sex	Depr/Disg/Anx/Ang/Rej/Guilt/Emb/Jeal
5-Apr	Morning	Enth/Cont/Amu/Pri/Curi/Symp/Love	Guilt/Disg/Anx/Jeal/Ang/Rej/Emb/Depr
7-Apr	Morning	Enth/Amu/Pri/Curi/Cont/Love/Symp	Rej/Emb/Ang/Jeal/Guil/Disg/Depr/Anx
8-Apr	Morning	Amu/Curi/Pri/Enth/Cont/Love/Symp/Sex	Ang/Disg/Depr/Rej/Anx/Emb/Guilt/Jeal
9-Apr	Morning	Amu/Enth/Pri/Curi/Cont/Love/Symp/Sex	Rej/Emb/Disg/Depr/Jeal/Ang/Anx/Guilt
11-Apr	Evening	Amu/Enth/Pri/Cont/Curi/Symp/Love	Anx/Guilt/Disg/Depr/Rej/Ang/Jeal/Emb/Sex

11-Apr	Morning	Enth/Amu/Cont/Pri/Curi/Symp/Love	Guilt/Anx/Depr/Emb/Rej/Jeal/Ang/Disg
12-Apr	Morning	Enth/Cont/Amu/Pri/Curi/Symp	Guilt/Rej/Disg/Anx/Jeal/Emb/Depr/Ang
13-Apr	Morning	Pri/Enth/Cont/Curi/Amu/Symp/Love	Anx/Depr/Guilt/Jeal/Emb/Ang
14-Apr	Evening	Curi/Amu/Enth/Pri/Cont/Symp/Love	Disg/Rej/Emb/Anx/Depr/Guilt/Anger/Sex
14-Apr	Morning	Enth/Curi/Amu/Pri/Cont/Symp/Love	Jeal/Depr/Rej/Emb/Guilt/Disg/Anx/Ang
15-Apr	Evening	Amu/Curi/Cont/Enth/Pri/Symp/Love/Sex	Disg/Rej/Anx/Depr/Guil/Jeal/Ang/Emb
15-Apr	Morning	Curi/Enth/Pri/Symp/Amu/Cont/Love/Jeal	Disg/Rej/Anx/Guilt/Emb/Ang/Depr
16-Apr	Evening	Enth/Amu/Cont/Pri/Curi/Love/Symp low Rej	Depr/Jeal/Guilt/Disg/Anx/Ang/Emb
16-Apr	Morning	Enth/Amu/Curi/Cont/Pri/Love/Symp/Sex	Jeal/Guilt/Ang/Depr/Rej/Anx/Disg/Emb
19-Apr	Evening	Enth/Amu/Cont/Pri/Curi/Love/Symp low Depr	Jeal/Emb/Rej/Anx/Guilt/Ang/Disg/Sex
19-Apr	Morning	Amu/Cont/Pri/Curi/Symp/Enth/Love	Rej/Emb/Disg/Anx/Jeal/Sex/ Depr/Guilt/Ang

Group 2: Positivity Factor, Internal Negativity, External Negativity				
Day	Time	Factor 1	Factor 2	Factor 3
16-Mar	Evening	Amu/Cont/Enth/Pri/Love/Sex/Curi	Depr/Guilt/Anx/Jeal/Emb	Rej/Disg/Ang
17-Mar	Evening	Amu/Pri/Enth/Cont/Love/Curi/Symp/Sex	Guilt/Emb/Depr/Jeal/Anx/Ang	Disg/Rej
19-Mar	Evening	Curi/Amu/Pri/Symp/Love/ Enth/Cont/Sex	Emb/Guilt/Anx/Jeal	Disg/Ang/ Depr/Rej
20-Mar	Morning	Amu/Enth/Pri/Curi/Cont/ Symp/Love low Ang	Anx/Guilt/Emb/Depr	Jeal/Rej/Sex/ Disg
26-Mar	Morning	Pri/Enth/Amu/Cont/Curi/ Symp/Sex/Love	Guilt/Jeal/Emb/Depr/Anx	Disg/Rej/Ang
28-Mar	Morning	Enth/Pri/Cont/Amu/Curi/ Symp/Love	Depr/Guilt/Anx/Jeal/Ang/Sex	Disg/Rej/Emb
31-Mar	Evening	Amu/Enth/Pri/Cont/Curi/Love/Symp	Depr/Guilt/Jeal/Emb	Disg/Rej/Anx/Ang
1-Apr	Evening	Cont/Pri/Amu/Enth/Curi/ Symp/Love	Guilt/Anx/Jeal/Depr/Ang/Emb	Rej/Disg
2-Apr	Evening	Curi/Enth/Amu/Cont/Pri/ Symp/Love low Ang	Emb/Guilt/Anx/Rej	Disg/Jeal/Depr
2-Apr	Morning	Curi/Enth/Pri/Amu/Cont/ Symp/Love/Sex	Guilt/Depr/Emb/Anx/Jeal	Disg/Rej/Ang
5-Apr	Evening	Pri/Enth/Cont/Amu/Curi/Love	Symp/Depr/Emb/Anx/Sex	Rej/Disg/Ang/Jeal

Day	Time	Factor 1	Factor 2	Factor 3
6-Apr	Evening	Amu/Pri/Enth/Curi/Cont/Love/Sex/Symp	Guilt/Depr/Anxi/Depr	Rej/Jeal/Disg/Ang
6-Apr	Morning	Amu/Enth/Cont/Curi/Pri/Love/Symp/Sex	Emb/Anx/Guil	Disg/Depr/Ang/Jeal/Rej
7-Apr	Evening	Curi/Pri/Amu/Enth/Cont/ Symp	Guilt/Jeal/Emb/Depr/Love/Sex/Anx	Disg/Rej/Ang
9-Apr	Evening	Enth/Cont/Curi/Pri/Amu	Anx/Love/Symp/Depr/Emb/ Guilt/Sex/Jeal	Rej/Disg/Ang
10-Apr	Morning	Curi/Pri/Amu/Cont/Enth/ Symp/Love	Guilt/Emb/Anx/Depr/Sex	Rej/Disg/Jeal/Ang
20-Apr	Evening	Cont/Pri/Curi/Amu/Enth/ Symp/Love	Guil/Depr/Emb	Jeal/Disg/Ang/Rej/Anx
20-Apr	Morning	Amu/Cont/Symp/Enth/Pri/ Curi/Love	Guilt/Emb/Jeal	Rej/Disg/Anx/Depr/Ang

Group 3: Positivity Factor, Negativity Factor, Romance Factor				
Day	Time	Factor 1	Factor 2	Factor 3
25-Mar	Evening	Enth/Cont/Pri/Amu/Curi/ Symp low Ang	Guilt/Emb/Rej/Jeal/Disg/Anx/Depr	Sex/Love
28-Mar	Evening	Cont/Enth/Pri/Amu/Curi	Guilt/Rej/Emb/Depr/Disg/Anx/Jeal/Ang	Symp/Love/ Sex
29-Mar	Evening	Cont/Pri/Enth/Amu/Curi	Ang/Anx/Depr/Disg/Emb/Rej/Guilt/Jeal	Love/Symp/ Sex
3-Apr	Evening	Enth/Pri/Cont/Amu/Curi	Rej/Emb/Guilt/Anx/Depr/Disg/Ang/Jeal	Love/Sex/ Symp

8-Apr	Evening	Cont/Enth/Pri/Curi/Amu	Disg/Rej/Jeal/Emb/Guilt/Anx/Ang	Love/Symp/ Sex
10-Apr	Evening	Cont/Enth/Pri/Amu	Emb/Jeal/Guilt/Anx/Disg/Rej/Ang/Depr	Love/Symp/ Sex/Curi
17-Apr	Evening	Amu/Cont/Pri/Enth/Curi/ Symp/Love/Sex	Guilt/Emb/Depr/Anx	Rej/Disg/Ang/Jeal
17-Apr	Morning	Pri/Enth/Amu/Cont/Curi	Disg/Rej/Jeal/Emb/Anx/Ang/Depr/Guilt	Love/Sex/ Symp

Group 4: Positivity Factor, Internal Negativity, External Negativity, Romance Factor

Day	Time	Factor 1	Factor 2	Factor3	Factor 4
22-Mar	Morning	Cont/Enth/Pri/Amu low Guilt	Anx/Depr/Jeal/Emb	Rej/Disg/Ang	Symp/Love/ Curi/Sex
24-Mar	Evening	Enth/Curi/Pri/Amu/Cont/ Symp	Emb/Guilt/ Anx/Depr	Rej/Disg/Ang/Jeal	Love/Sex
24-Mar	Morning	Enth/Curi/Pri/Cont/Amu/ Symp	Guilt/Emb/ Anx/Depr	Disg/Rej/Ang	Love/Sex/Jeal
26-Mar	Evening	Enth/Pri/Cont/Amu/Curi	Emb/Guilt/ Anx/Depr	Rej/Ang/Disg/Jeal	Love/Sex/ Symp
30-Mar	Evening	Enth/Pri/Cont/Amu/Curi	Guilt/Depr/ Anx/Emb/Ang/Jeal	Disg/Rej	Love/Symp/ Sex
30-Mar	Morning	Pri/Enth/Amu/Cont/Curi	Guilt/Anx/ Depr/Jeal/Emb	Rej/Disg/Ang	Love/Sex/ Symp
31-Mar	Morning	Enth/Cont/Amu/Curi/Pri	Guilt/Emb/ Anx/Depr	Disg/Rej/Ang/Jeal	Symp/Love/ Sex

1-Apr	Morning	Pri/Cont/Enth/Amu/Curi/ Symp	Emb/Depr/ Anx/Ang/Guilt	Disg/Rej/Jeal	Love/Sex
12-Apr	Evening	Enth/Pri/Amu/Curi/Cont low Depr	Jeal/Anx/Guilt/Emb/Ang	Disg/Rej	Love/Symp/ Sex
13-Apr	Evening	Enth/Cont/Pri/Cont/Amu low Depr	Anx/Emb/ Guilt	Disg/Rej/Jeal/Ang	Love/Symp/ Sex
18-Apr	Evening	Enth/Cont/Pri/Amu/Curi	Depr/Guilt/ Emb/Anx/Jeal	Disg/Rej/Ang	Love/Sex/ Symp
18-Apr	Morning	Enth/Cont/Curi/Pri/Amu	Anx/Depr/ Guilt/Emb	Rej/Disgust/ Jeal	Symp/Love low Ang

Group 5: Positivity Factor, External Negativity, Romance, Two Internal Negativity Factors					
Day	Time	Factor 1	Factor 2	Factor3	Factor 4	Factor 5
22-Mar	Evening	Enth/Pri/Cont/Curi/Amu	Rej/Disg/Ang/Jeal	Symp/Love/ Sex	Anx/Depr	Guilt/Emb

Table 3: Person-Centered Analyses Organized by Group

Group 1: One Valence Factor	
Part N	Factor 1
12	Depr/Rej/Ang/Disg/Anx/Guilt/Jeal/Emb low Cont/Enth/Amu/Pri/Symp/Curi/Sex
46	Enth/Curi/Amu/Pri/Love/Sex/Symp low Ang/Disg/Rej/Guilt/Depr
13	Disg/Rej/Jeal/Ang/Guil/Depr/Emb/Anx low Cont/Curi/Pri/Amu/Enth/Love/Symp
20	Pri/Enth/Amu/Cont/Love/Curi low Ang/Depr/Anx/Rej/Disg
49	Enth/Pri/Cont/Amu/Curi/Symp/Love low Depr/Guilt/Ang/Disg/Rej/Jeal/Anx/Emb
52	Cont/Pri/Enth/Amu/Symp/Curi/Love low Ang/Guilt/Emb/Depr/Anx
22	Disg/Rej/Ang/Emb/Depr/Guil low Cont/Enth/Pri

Group 2: Valence Factor and Romantic Relationship Factor		
Part N	Factor 1	Factor 2
29	Anx/Depr/Emb/Guilt/Ang/Rej/Disg/Jeal low Cont/Enth/Pri/Amu/Curi	Love/Sex/Symp
34	Depr/Ang/Guilt/Jeal/Anx/Disg/Rej/Emb low Cont/Enth/Pri/Curi	Love/Symp/Sex/Amu
44	Depr/Rej/Guilt/Anx/Emb/Ang/Disg low Enth/Pri/Cont/Curi/Amu	Love/Sex/Symp
41	Ang/Depr/Rej/Disg/Jeal/Anx/Emb/Guilt low Cont/Enth/Pri/Amu	Love/Sex
43	Depr/Guilt/Anx/Ang/Curi low Cont/Pri/Enth	Love/Symp/Amu/Jeal
50	Enth/Cont/Amu/Pri/Curi low Depr/Ang/Rej/Anx	Love/Symp/Sex/Emb
23	Ang/Depr/Rej/Emb/Disg/Guilt/Anx low Enth/Pri/Cont/Amu/Love	Jeal/Curi/Symp/Sex

| 8 | Cont/Pri/Enth/Amu/Curi low Depr/Guilt/Anx/Symp | Love/Sex low Rej/Disg/Ang |
| 17 | Guilt/Anx/Depr/Emb/Jeal/Ang low Cont/Enth/Amu/Curi | Disg/Rej low Love/Symp |

Group 3: Valence and External Negative Factor		
Part N	**Factor 1**	**Factor 2**
47	Enth/Amu/Cont/Symp/Curi/Pri/Love/Sex low Depr/Guilt/Emb/Anx	Rej/Disg/Ang/Jeal
48	Pri/Enth/Cont/Amu/Curi/Symp/Love low Depr	Disg/Rej/Ang/Anx/Emb
32	Enth/Cont/Curi low Depr/Symp	Emb/Disg/Anger
1	Guilt/Emb/Depr/Ang/Disg/Anx low Enth/Pri/Cont/Amu/Curi	Rej
39	Cont/Love/Pri/Enth low Anx/Guilt/Emb/Depr	Ang/Disg/Rej/Jeal low Curi/Amu/Symp

Group 4: Positivity Factor and Negativity Factor		
Part N	**Factor 1**	**Factor 2**
10	Enth/Cont/Amu/Curi/Pri/Love	Disg/Rej/Ang/Depr/Anx
19	Amu/Enth/Curi/Pri/Cont/Love/Symp/Sex	Guilt/Emb/Rej/Depr/Jeal/Anx/Disg/Ang
27	Amu/Enth/Love/Curi/Symp	Disg/Rej/Depr/Ang/Emb/Guilt/Anx low Cont/Pri
31	Symp/Amu/Curi/Love/Pri/Enth/Sex	Ang/Emb/Guilt/Anx/Depr/Jeal/Rej/Disg low Cont
21	Enth/Pri/Curi/Amu/Cont/Love	Ang/Depr/Disg/Jeal/Anx/Rej/Guilt/Symp
33	Enth/Cont/Pri/Love/Symp/Curi	Depr/Anx/Rej/Disg/Emb/Jeal/Guilt low Amu

40	Symp/Amu/Love/Sex/Jeal/Curi/Enth/Cont	Depr/Anx/Ang/Rej/Guilt/Emb low Pri
36	Amu/Sex/Enth/Curi/Symp/Love low Depr	Rej/Disg/Ang/Jeal/Emb/Anx/Guilt low Pri/Cont

Group 5: Positive Factor, Negative Factor, and Romantic Relationship Factor			
Part N	Factor 1	Factor 2	Factor 3
45	Enth/Curi/Amu/Pri/Cont/Symp	Disg/Jeal/Rej/Ang/Guilt/Anx/Emb	Love/Sex/Depr
42	Curi/Cont/Enth/Pri/Amu/Symp	Emb/Anx/Disg/Ang/Depr/Jeal/Rej	Love/Sex
6	Enth/Cont/Amu/Curi/Pri low Depr	Disg/Ang/Anx/Emb/Guilt/Rej/Jeal	Love/Symp/Sex
11	Cont/Pri/Enth/Curi	Anx/Depr/Guilt/Emb/Jeal/Symp/Ang	Love/Sex/Amu low Rej
26	Cont/Enth/Pri/Curi/Amu low Rej/Disg	Jeal/Guilt/Anx/Depr/Emb	Love/Symp/Sex low Ang
24	Curi/Enth	Disg/Guilt/Ang/Emb/Rej/Depr/Anx/Jeal low Cont/Pri	Love/Sex/Amu/Symp

Group 6: Positive Factor, Internal Negative Factor, and External Negative Factor			
Part N	Factor 1	Factor 2	Factor 3
3	Cont/Enth/Amu/Love/Curi/Symp/Pri/Sex low Anx/Depr	Rej/Disg/Ang	Guilt/Emb
25	Enth/Amu/Pri/Curi/Symp/Love low Ang	Rej/Disg	Guilt/Anx/Emb/Depr/Jeal low Cont
30	Symp/Sex/Pri/Love/Amu/Enth/Cont low Anx	Disg/Ang/Rej	Guilt/Depr/Emb/Jeal

38	Enth/Cont/Pri/Curi/Amu low Ang/Depr	Anx/Rej/Emb	Guilt/Disg
15	Love/Enth/Amu/Curi/Sex/Pri/Cont/Symp	Rej/Disg/Jeal	Guilt/Emb/Depr/Ang
35	Amu/Cont/Enth/Love/Symp	Rej/Disg/Ang/Depr/Guilt/Emb	Pride/Curi/Anx

Group 7: Positive Factor, External Negative Factor, Internal Negative Factor, Romantic Relationship Factor			
Part N	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**
51	Amu/Curi/Pri/Enth/Cont	Rej/Ang/Disg/Jeal	Guilt/Emb/Anx/Depr	Sex/Love/Symp
5	Pri/Enth/Amu/Cont/Curi	Disg/Rej/Ang/Jeal	Emb/Guilt/Anx	Love/Symp/Depr/Sex
37	Cont/Enth/Amu/Curi/Pri	Ang/Depr/Disg	Guilt/Emb/Anx	Sex/Love/Symp
4	Pri/Cont/Enth/Curi/Amu/Symp low Depr/Anx	Disg/Rej/Ang	Emb/Guilt	Love/Sex
9	Enth/Cont/Pri/Amu low Ang	Disg/Reject/Depr/Anx	Guilt/Emb	Symp/Curi/Love
7	Pri/Amu/Enth/Cont/Curi	Disg/Rej/Ang	Depr	Love/Symp/Anx
14	Pri/Cont low Emb/Guil/Anx	Ang/Rej/Disg	low Symp/Depr	Love/Sex/Amu

Group 8: Two Positive, Two Negative Factors			
Part N	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**
28	Pri/Enth/Cont/Love	Curi/Amu	Depr/Guilt/Anx/Symp	Ang/Disg/Rej

| 18 | Enth/Curi/Cont/Pri/Amu low Emb | Symp | Guilt/Anger | Anx/Depr/Disgust |

Group 9: Positive Factor, External Negative Factor, Romantic Relationship Factor, Two Internal Negative Factors

Part N	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
2	Cont/Pri/Enth low Symp	Ang/Disg	Sex/Amu/Love/Curi	Emb/Anx	Depr/Guilt
16	Pri/Curi/Enth/Cont	Disg/Rej/Ang	Love/Sex	Anx/Depr/Symp	Emb/Guilt/Amu

Figure 1: Nomothetic Model with A Positivity and Negativity Factor
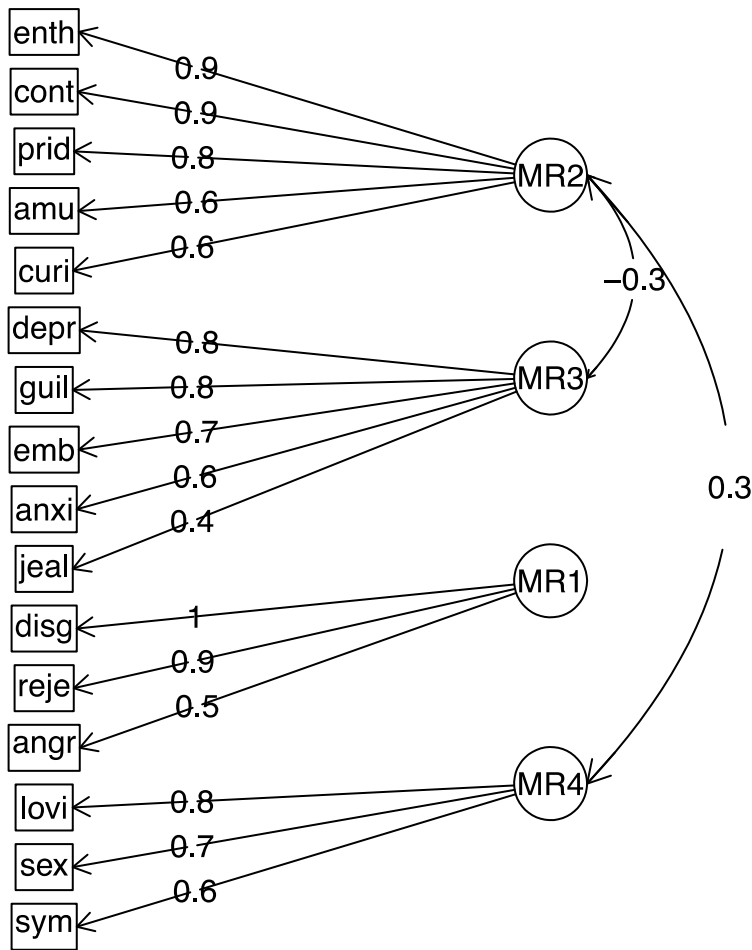

Factor Diagram for 2017_04_11 Morning
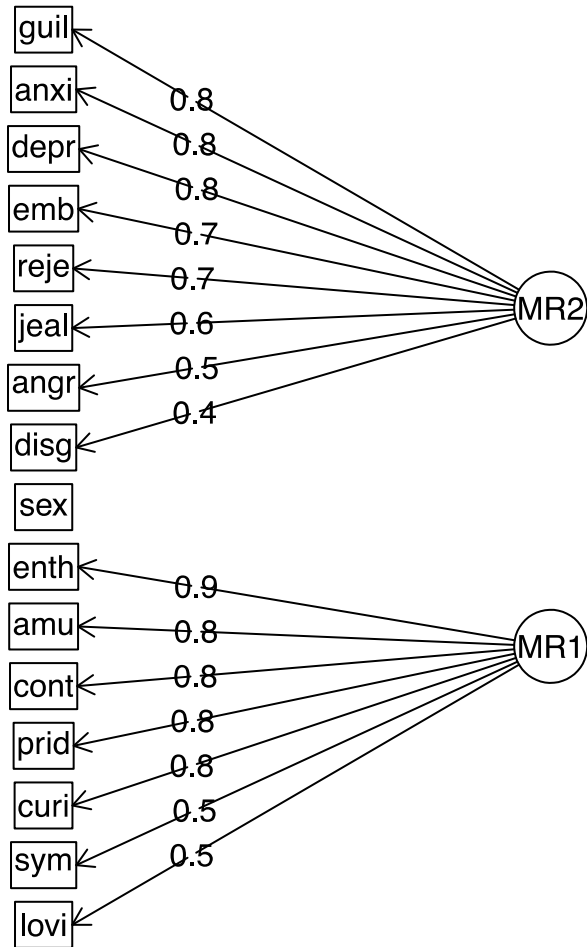
Note: Black lines indicate positive loadings. Red lines indicate negative loadings. The strength of the loading of the particular item on the factor is written on top of the line. Only loadings over 0.3 are depicted. Variable abbreviations that do not have a line connecting them to a factor do not load highly on any factor. Graphics are generated through the "psych" package in R (Revelle, 2017).

Figure 2: Nomothetic Model with Positivity, Internal Negativity, and External Negativity Factors
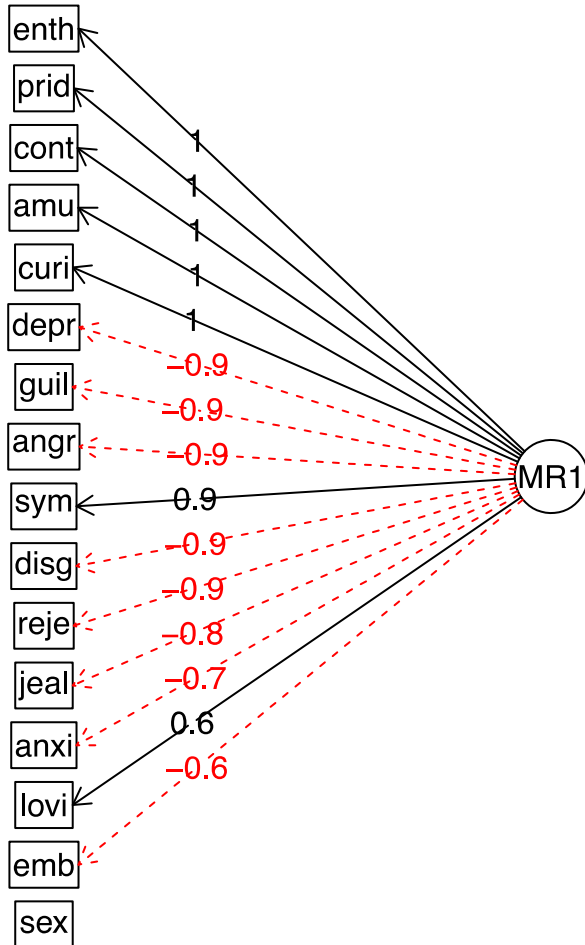
Factor Diagram for 2017_04_07 Evening
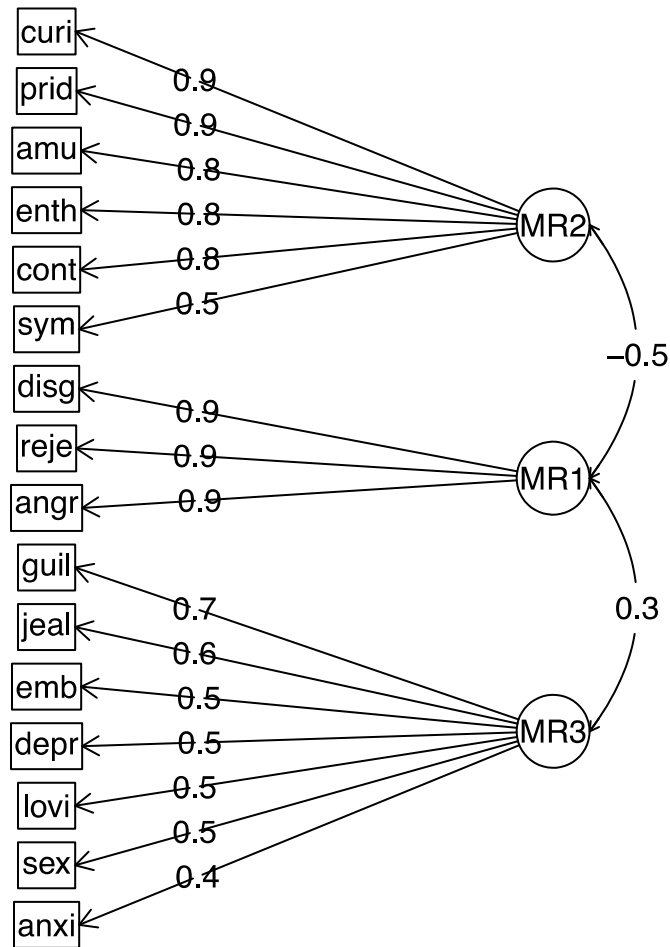
Note: Black lines indicate positive loadings. Red lines indicate negative loadings. The strength of the loading of the particular item on the factor is written on top of the line. Only loadings over 0.3 are depicted. Variable abbreviations that do not have a line connecting them to a factor do not load highly on any factor. Graphics are generated through the "psych" package in R (Revelle, 2017).

Figure 3: Nomothetic Model with Positivity, Negativity, and Romantic Relationship Factors
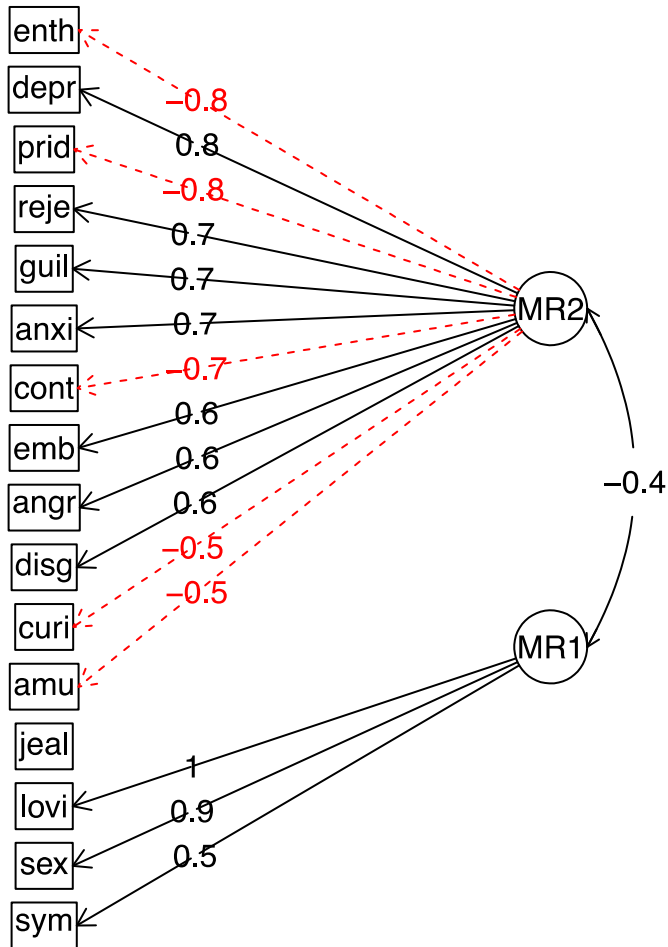

Factor Diagram for 2017_03_29 Evening
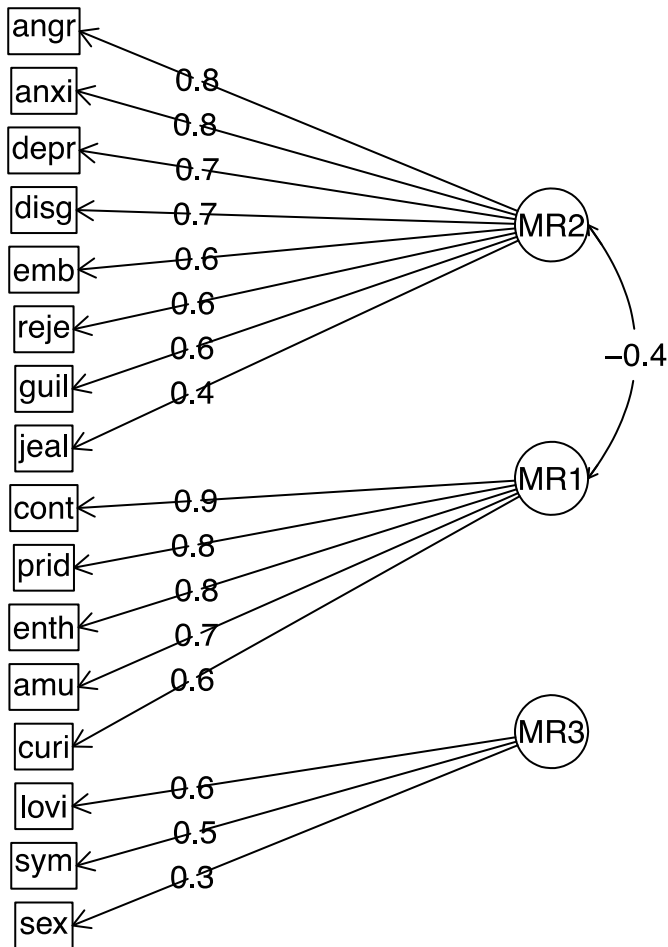
Note: Black lines indicate positive loadings. Red lines indicate negative loadings. The strength of the loading of the particular item on the factor is written on top of the line. Only loadings over 0.3 are depicted. Variable abbreviations that do not have a line connecting them to a factor do not load highly on any factor. Graphics are generated through the "psych" package in R (Revelle, 2017).

Figure 4: Nomothetic Model with Positivity, Internal Negative, External Negative, and

Romantic Relationship Factors

Note: Black lines indicate positive loadings. Red lines indicate negative loadings. The

strength of the loading of the particular item on the factor is written on top of the line.

Only loadings over 0.3 are depicted. Variable abbreviations that do not have a line

connecting them to a factor do not load highly on any factor. Graphics are generated

through the "psych" package in R (Revelle, 2017).

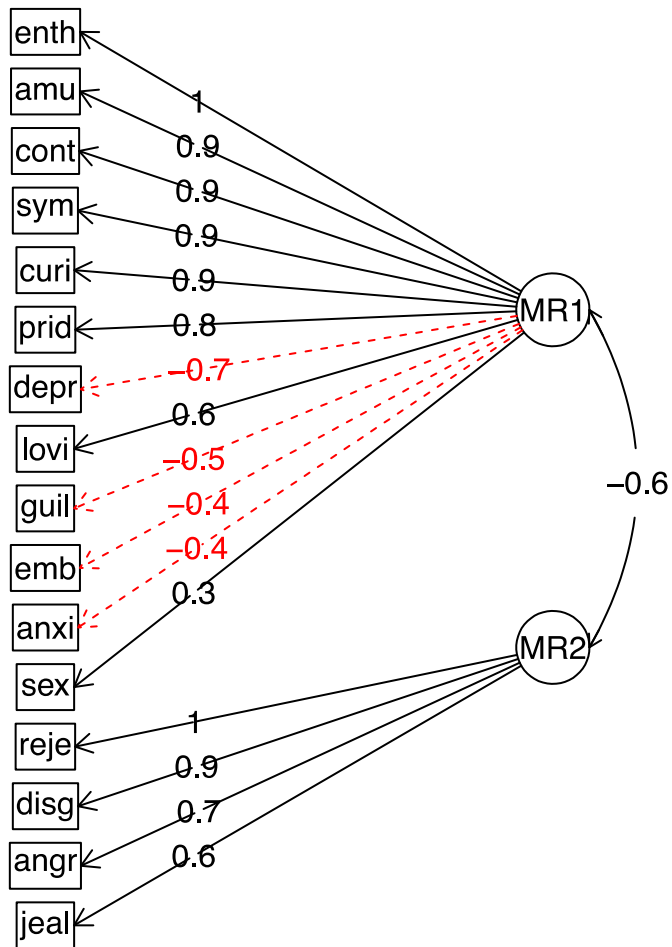Figure 5: Idiographic Model with a One-Factor Structure

Factor Diagram for Participant 49

Note: Black lines indicate positive loadings. Red lines indicate negative loadings. The strength of the loading of the particular item on the factor is written on top of the line. Only loadings over 0.3 are depicted. Variable abbreviations that do not have a line connecting them to a factor do not load highly on any factor. Graphics are generated through the "psych" package in R (Revelle, 2017).

Figure 6: Idiographic Model with Valence and Relationship Factors

Factor Diagram for Participant 44

Note: Black lines indicate positive loadings. Red lines indicate negative loadings. The strength of the loading of the particular item on the factor is written on top of the line. Only loadings over 0.3 are depicted. Variable abbreviations that do not have a line connecting them to a factor do not load highly on any factor. Graphics are generated through the psych package in R (Revelle, 2017).

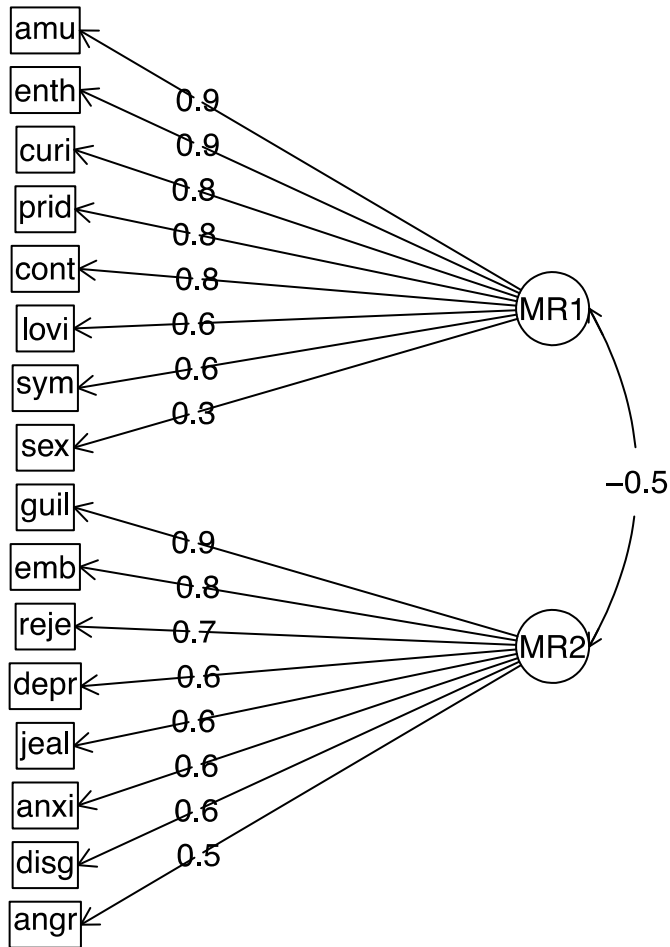Figure 7: Idiographic Model with Valence and External Negative Factors

Factor Diagram for Participant 47

Note: Black lines indicate positive loadings. Red lines indicate negative loadings. The strength of the loading of the particular item on the factor is written on top of the line. Only loadings over 0.3 are depicted. Variable abbreviations that do not have a line connecting them to a factor do not load highly on any factor. Graphics are generated through the psych package in R (Revelle, 2017).

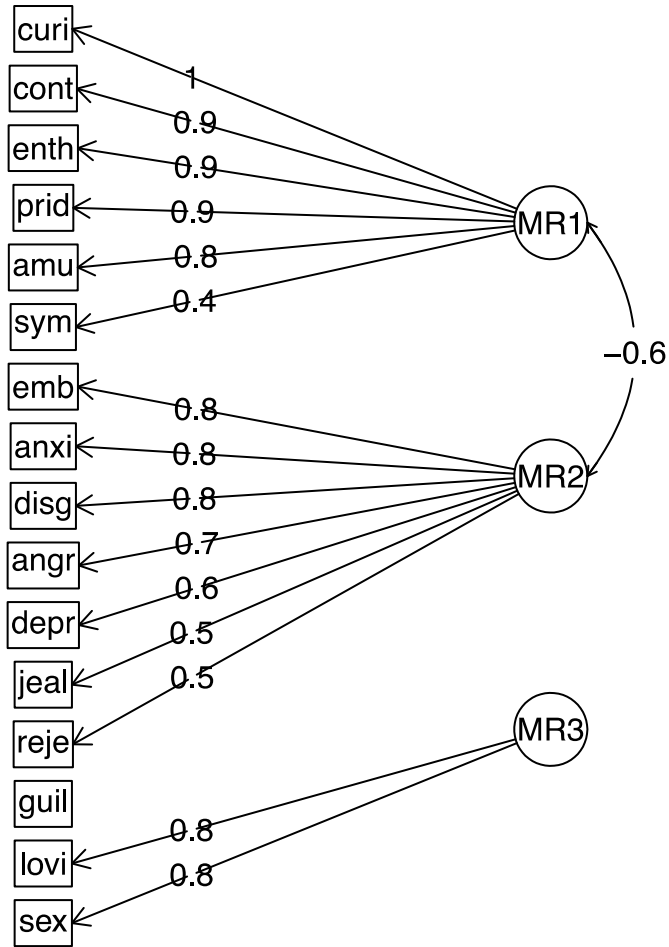Figure 8: Idiographic Model with Positivity and Negativity Factors

Factor Diagram for Participant 19

Note: Black lines indicate positive loadings. Red lines indicate negative loadings. The strength of the loading of the particular item on the factor is written on top of the line. Only loadings over 0.3 are depicted. Variable abbreviations that do not have a line connecting them to a factor do not load highly on any factor. Graphics are generated through the psych package in R (Revelle, 2017).

Figure 9: Idiographic Model with Positive, Negative, and Romantic Relationship Factors
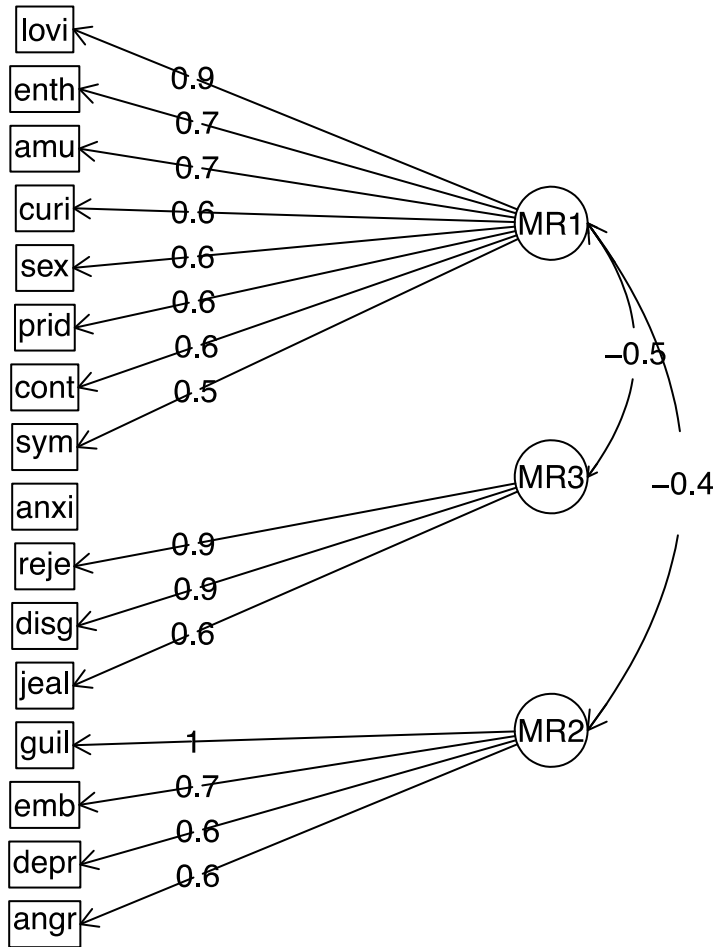
Factor Diagram for Participant 42

Note: Black lines indicate positive loadings. Red lines indicate negative loadings. The strength of the loading of the particular item on the factor is written on top of the line. Only loadings over 0.3 are depicted. Variable abbreviations that do not have a line connecting them to a factor do not load highly on any factor. Graphics are generated through the psych package in R (Revelle, 2017).

Figure 10: Idiographic Model with Positive, Internal Negative, and External Negative
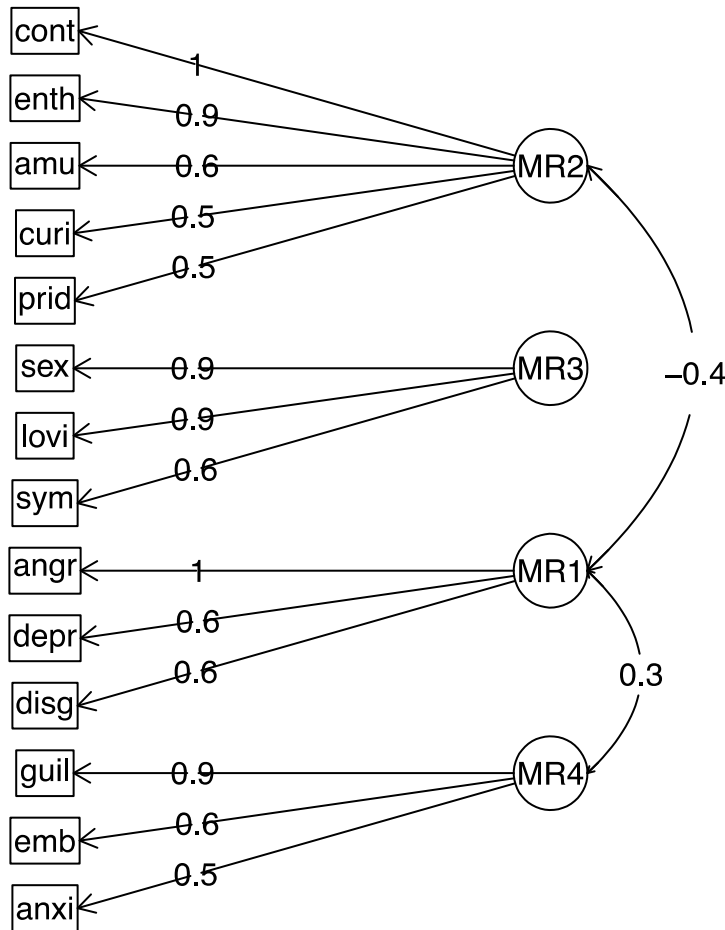
Factors

Factor Diagram for Participant 15

Note: Black lines indicate positive loadings. Red lines indicate negative loadings. The strength of the loading of the particular item on the factor is written on top of the line. Only loadings over 0.3 are depicted. Variable abbreviations that do not have a line connecting them to a factor do not load highly on any factor. Graphics are generated through the psych package in R (Revelle, 2017).

Figure 11: Idiographic Model with Positive, External Negative, Internal Negative, and Romantic Relationship Factors
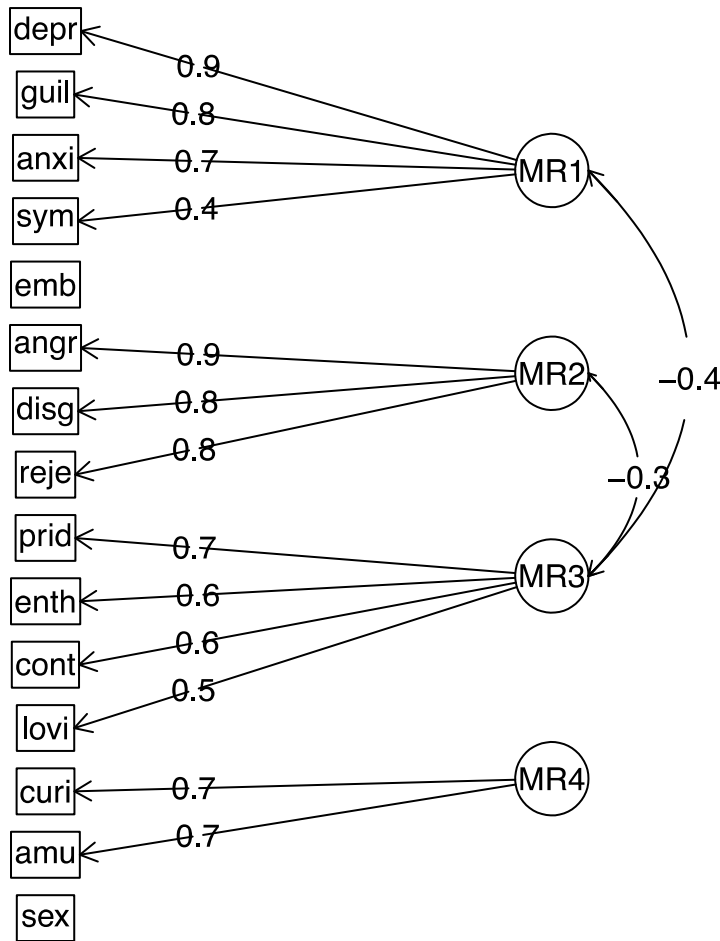

Factor Diagram for Participant 37

Note: Black lines indicate positive loadings. Red lines indicate negative loadings. The strength of the loading of the particular item on the factor is written on top of the line. Only loadings over 0.3 are depicted. Variable abbreviations that do not have a line connecting them to a factor do not load highly on any factor. Graphics are generated through the psych package in R (Revelle, 2017).

Figure 12: Idiographic Model with Two Positive and Two Negative Factors

Factor Diagram for Participant 28

Note: Black lines indicate positive loadings. Red lines indicate negative loadings. The strength of the loading of the particular item on the factor is written on top of the line. Only loadings over 0.3 are depicted. Variable abbreviations that do not have a line connecting them to a factor do not load highly on any factor. Graphics are generated through the psych package in R (Revelle, 2017).

Figure 13: Idiographic Model with Positive, External Negative, Romantic Relationship,

and Two Internal Negative Factors
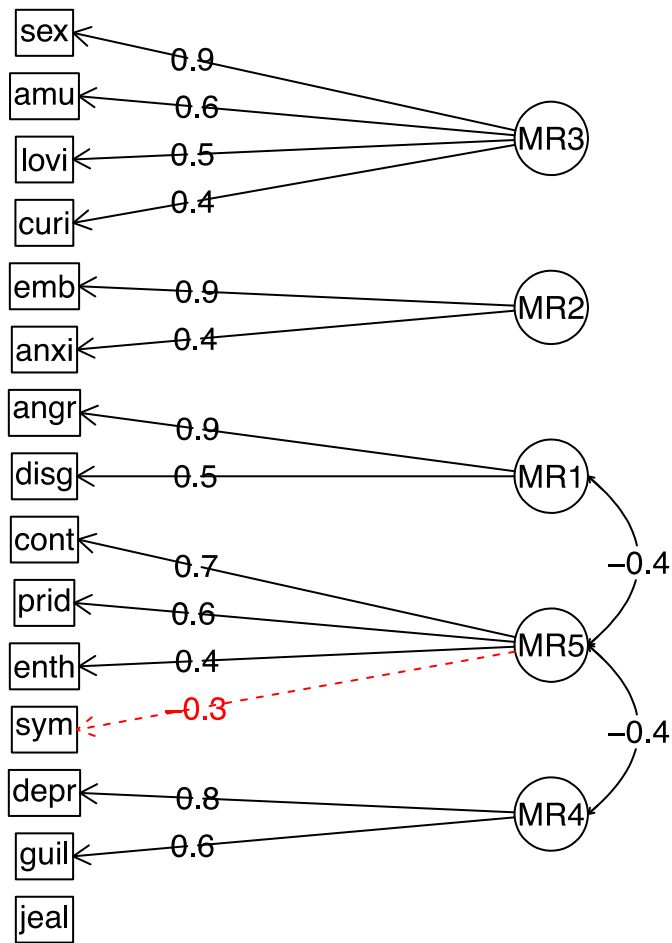
Factor Diagram for Participant 2

Note: Black lines indicate positive loadings. Red lines indicate negative loadings. The

strength of the loading of the particular item on the factor is written on top of the line.

Only loadings over 0.3 are depicted. Variable abbreviations that do not have a line

connecting them to a factor do not load highly on any factor. Graphics are generated

through the psych package in R (Revelle, 2017).

Figure 14: The Most Common Two-Dimensional Structure of Affect in a Person-Centered Analysis

Low Valence, High
Relationship Focus

- Feeling negative
- Feeling love and sympathy

High Valence, High
Relationship Focus

- Feeling positive
- Feeling love and sympathy

Emotional Valence

Low Valence, Low
Relationship Focus

- Feeling negative
- Feeling low love and jealousy

Low Valence, High
Relationship Focus

- Feeling positive
- Feeling low love and jealousy

Relationship-Focused Emotion